MINING WORLD

MAY 1958

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Mining Utah U_3O_8 At Radium King

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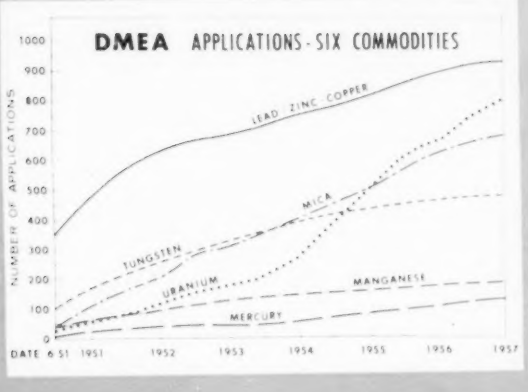

Why DMEA Must Be Continued

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Safety First From Sump To Dump

Sinking Farm Resources' Potash Shaft

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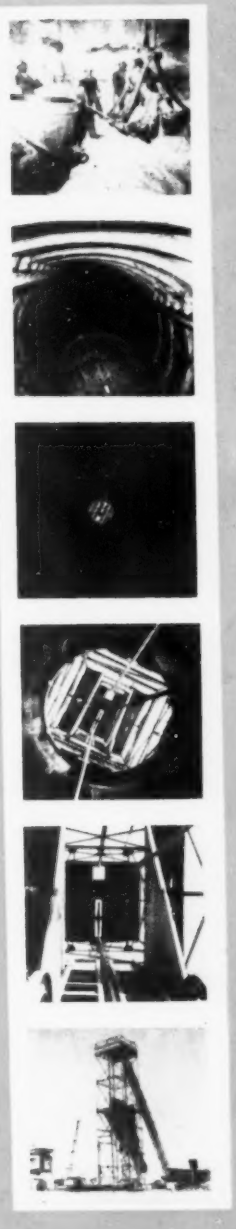

How Porter Bros, Mills Euxenite

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PRODUCER

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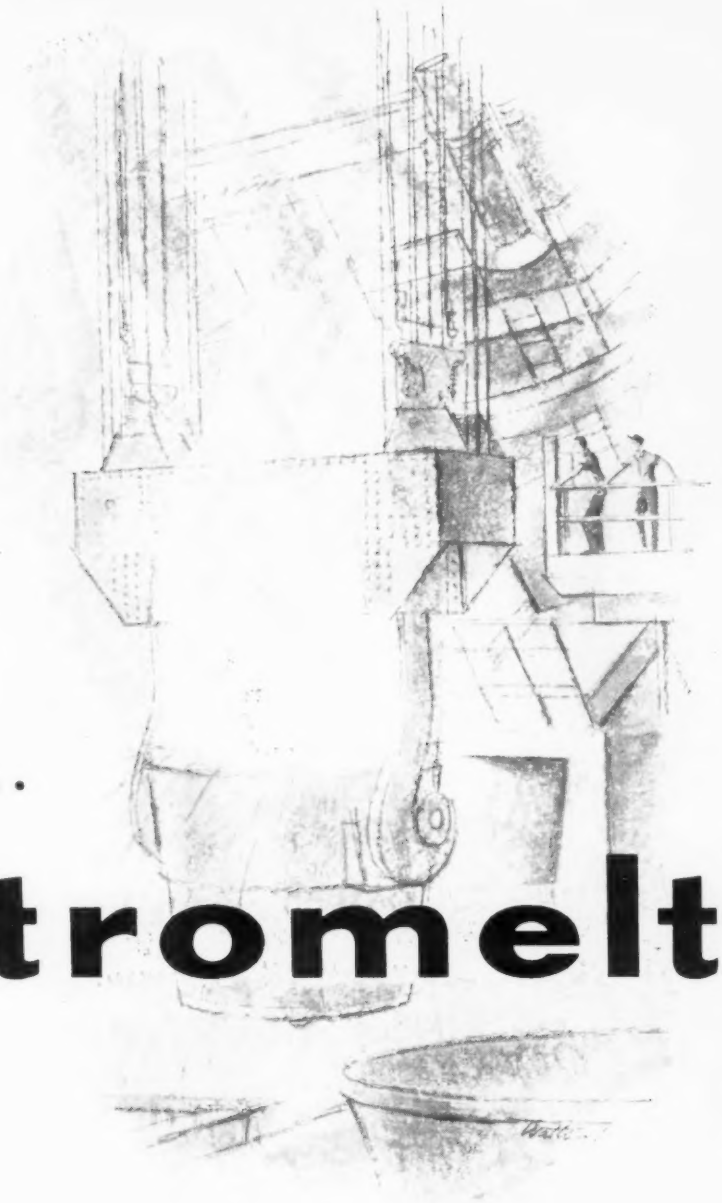

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Catalog 10 describes efficient, time-proven Lectromelt furnaces and equipment.

Q: WHICH D7 IS THE OLD-TIMER?

This Cat D7 Tractor with No. 7S Bulldozer feeds the grizzly about 450 tons of gold ore a day.

This Cat D7 Tractor with No. 7S Bulldozer, working in heavy wet sand, is building a 2-mile-long dike.

A: If you know your Cat Diesel Tractors, you've spotted it on the left. It's 12 years old. With the new D7 and a D8, it's used by the London Extension Mining Co. in an open pit mining operation 30 miles from Beowave, Nevada. The climate's rugged. Temperatures range from −20° to 110°.

Q: What does the company think of the machines?

A: It has had Caterpillar-built equipment since 1936. General Superintendent R. B. Warmbrodt says: "We find the tractors are rugged and stand up well."

Q: How are the machines used?

A: Generally one is kept in the pit cleaning up around shovels, while the other feeds the grizzly 450 tons of ore a day. The machines also strip overburden, handle tailings and knock down dump piles from trucks at the stockpile. Two months a year, the new D7 builds about 2 miles of dike to control tailings. The machines are on duty 7 days a week all year 'round.

Q: How do the D7s compare in production?

A: Good as the old D7 is, it's not in the same league with the modern, heavy-duty D7. Of course, that's to be expected. Caterpillar constantly builds improvements into its machines. The new D7 is more powerful, easier to operate and more rugged. For example, among many modern features, it has the oil clutch that delivers 1,500 hours without adjustment.

Q: Has the company any other Caterpillar equipment?

A: Yes. Two engines in shovels and two in compressors. Mr. Warmbrodt says: "Since we're far from supply, we find the parts interchangeability of Caterpillar units a decided advantage. We also get excellent service from our Caterpillar Dealer!"

Add all this up and you get some of many reasons why it will pay you to use a Cat Diesel Tractor on your operation. You can't beat the combination of rugged machines, parts availability and good dealer service. Ask your Caterpillar Dealer to give you the low-down on the new D7's high productive capacity. Better still, watch one work —ask him to demonstrate on your job!

Caterpillar Tractor Co., San Francisco, Calif.; Peoria, Ill., U.S.A.

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Mining World

Including the Export Edition **WORLD MINING**

Published monthly except in April when publication is semi-monthly

VOLUME 20 **MAY 1958** No. 6

OPERATIONS—TECHNOLOGY

Metallurgy

How Porter Bros. Treats Radioactive Black Sands 36

By Stanley H. Dayton

In one of the world's most unique mills, Porter Bros. Corporation recovers columbite-euxenite and monazite from jig-concentrated black sands. Electro-magnetic, high tension separation and gravity concentration are used.

Exploration

The DMEA Program . . . How It Works . . . The Results 42

The DMEA has reached a critical stage. Congress must pass legislation to make it permanent. Results certainly warrant continuation; 316 certified projects indicate ore discoveries valued at $465,000,000.

Underground Mining

How Radium King Mines Uranium With Electric Caterpillar 48

In Red Canyon, Utah, Radium King has a completely electrified mine and camp using a Caterpillar Diesel-electric set to generate power to operate compressors, fans, hoist, and a converted Traxcavator loader.

Safety First Sinking Farm Chemical's Carlsbad Shaft 52

By James A. Lilly

McKenzie & Whittle, Design Engineers and Contractors, sunk the 1,695 foot, 15-foot-diameter round vertical shaft of Farm Chemical Resources Development Corporation using only 32 men. The best month's footage was 300; the best week, 90 feet.

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MILLER FREEMAN PUBLICATIONS

GRAB SAMPLES From the Mail

East Pima Is Geophysical

Dear Sir:

This refers to your comments regarding the East Pima, Arizona project of the American Smelting and Refining Company. You credit this to be: "The Geologic Discovery of the Year: but in the last sentence of the paragraph, you state:

"Its discovery followed geologic projection of known ore bodies in the nearby Pima Mining Company and Banner Mining Company mines."

Obviously, if this statement is correct, the East Pima development would not be a *discovery* at all, but is instead, only normal development along known ore extensions.

The fact is that East Pima is a new discovery, which is the result of a well coordinated exploration program, to which valuable contributions have been made by our Geological and Geophysical Departments. The principal geological contribution was to select and recommend the area for careful investigation by our Geophysical Department. Information obtained in geophysical surveys pinpointed the important *new* discovery. "Geological projection of known ore bodies" had no part in this program, although known mineralization in the area was one of the factors that led our geologists to classify the district as worthy of further investigation.

Since our geologists and geophysicists have done a commendable job on East Pima, it seems unfair to them to classify their accomplishments as routine "geologic projection of known ore bodies."

L. H. Hart
Chief Geologist

Congratulations to ASARCO's staff for making this "Geophysical Discovery of the Year." Details of this and other discoveries are usually tightly guarded company secrets during initial work.—Ed.

Extensive Dredge Applications

Dear Sir:

On page 54 of the January 1958 issue of Mining World mention is made of a calibrated Gamma counter.

This equipment might have extensive applications on our dredges, on stacker pumps, on slime pump discharge lines and we would much appreciate your assistance in getting in touch with the suppliers.

We would like to receive data on the automatic recorder to cover from 8- to 16-inch-diameter piping.

Anglo-Oriental (Malaya) Limited
Kuala Lumpur, Malaya

Sure Would Find Useful

Dear Sir:

I have just visited a manganese mine in Morocco and found surprisingly that they do not receive copies of World Mining. I am sure that they would find it useful, as I do, to receive your excellent publication and so suggest that their address is as follows: Société Anonyme Chérifienne d'Etudes Minières, Casablanca, Morocco.

D. Maldum Hay
Naylor, Benzon & Co. Ltd.
London, England.

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No. 5 in a series

Right off the Wire

An automatic ultrasonic welder makes tack welds without heat at the rate of 200 inches per minute.

Miniature mercury lamps are being used in batteries of twelve for night aerial photography. An area of sixteen square miles can be lighted from an altitude of 20,000 feet.

A new electron microscope permits the examination of opaque specimens.

An electronic converter makes any radio an appliance timer.

A three-year test of a 43,000-pound ship's propeller made of nialite (nickel-cadmium bronze) shows no wear caused by erosion or cavitation.

D. W. Kitchin and O. S. Pratt of Simplex recently made two major discoveries in studying corona spaces in cables — one, by observing internal pressure decrease, and another by mapping with silver cyanide solution.

A distillation column sixteen feet high and made entirely of glass is said to be the world's largest. It will be used to make silicon carbide with impurities of only one part in ten billion.

It has been demonstrated for the first time that petroleum is a colloidal dispersion. This knowledge may help in obtaining greater recovery from existing oil reserves.

A giant machine to hold large assemblies for welding can lift, tilt and rotate weights up to forty tons.

A tiny photoflash bulb is said to give the same amount of light as one four times its size. It uses zirconium rolled to foil gauge.

Over 1300 industrial concerns in this country are now using radioactive byproducts. About 200 were added to this list during the last year.

Air power for generators in remote installations, such as aids to air or marine navigation, can be supplied by a modern windmill which has a thirty-foot, three-bladed "propeller." It maintains constant speed.

Temperatures as high as 3500°F. are resisted by a new molded plastic.

Polyethylene is now made with an ultraviolet inhibitor and is said to last four times longer than the unprotected form.

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

Nuclear reactors may be used as economical sources of heat to convert coal into gaseous or liquid fuels.

A stereo cartridge to play the 45-45 Westrex groove records is in production.

South Carolina is putting its automobile drivers' licenses on photosensitive, anodized aluminum. They will be used for four years.

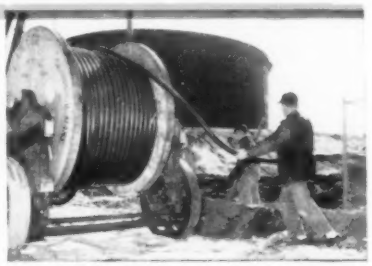
Speeds of 15,000 miles per hour and temperatures as high as 18,000°F. can be reached momentarily in a new wind tunnel being built to test missile nose cones.

"Silicone Insulation as Applied to Wire and Cable" is the title of a research paper by P. H. Ware of Simplex. This insulation is trade named "Thermoplex".

Flexible tanks of rubberized fabric are being made for use in the oil fields. They hold 15,000 gallons, but can be rolled into a package eight feet by two and one half feet when empty.

Kraft paper, shrunk after forming, is being used for shopping bags and multi-walled sacks. It stretches under tension and is said to be twenty per cent stronger than papers now in use for this purpose.

A portable scale that needs no pit is made for roadside weighing. It can handle vehicles sixty feet long weighing seventy tons.



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MILLER FREEMAN PUBLICATIONS

Drifts and Crosscuts

DMEA and AEC Deserve Thanks and Support

Bureaucracy to many immediately and always means inefficiency, waste, bungling, usurption of power, and dictatorial actions. And to many, any federal governmental agency, commission, or department automatically means bureaucracy. Too often these are true. The mining industry, individuals, and, yes, Editors, too, most often blame and criticize. It's warranted, too, and that's part of an Editor's job to point out, ask questions, and demand that laws, rules, and regulations be impartially enforced under the intent and word of the law.

Bureaucrats too often haven't followed the meaning and intent of Congress and the laws pertaining to the minerals industry. The recent action of Congress itself in passing the law to promote and encourage domestic tungsten production and then not appropriating funds to make good its heretofore sacred trust and duty reached the sump of integrity.

That's why the records and actions of the Defense Minerals Exploration Administration and the Raw Materials Division of the United States Atomic Energy Commission have reached an all time high in efficiency, fairness, and understanding.

Don't think for a minute that every miner has or ever can subscribe 100 percent to the impartiality and judgment of either agency. But the actions and policies of the agencies as a whole are equitable. And with these we are now concerned.

First the DMEA. It hasn't always been perfect, but the staff members have done a good job in cooperation with the mining industry to make the program effective, workable, and with a minimum of Bureaucratic red tape so that action can be concentrated on digging.

Notable and important ore discoveries have been and are being made under the exploration program. These discoveries cover minerals from andalusite to zircon, from border to border, and coast to coast.

The exploration program has worked too for all segments of the industry—from the one man prospector to some of the world's largest and most highly integrated base metal producers. That's the way it should be, too, in this country.

The DMEA may be approaching a critical point. Its future is uncertain. Encouragingly, the first Secretary Seaton Long Range Minerals Program (1957) called for continuance of the DMEA. The second Seaton program announced for presentation the end of April is certain to carry the same recommendation.

The industry can do its part. Write your Congressmen and Senators, now, and when legislation is placed before Congress urging the continuance of DMEA.

The Atomic Energy Commission, through its Raw Materials Division, has taken many effective steps to stimulate discovery and production of uranium. To many in Washington it looked too effective and on October 28, 1957 the Commission announced that no new contracts would be negotiated for milling facilities.

This put many individuals and companies on the spot. Under AEC's spurring they invested time and money to find uranium ore. The cutoff was too quick.

Individuals, companies, and state mining associations did not panic; they asked for hearings before the Commission. From these hearings the Commission saw the need for an ore marketing study, and made such a study.

The findings of this study have just been released. Five areas need additional milling capacity. It is anticipated that milling contracts will be negotiated to assure markets for ore developed before November 1, 1957.

Don't think bureaucrats when you think DMEA and AEC. Instead, thank DMEA and AEC.

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Thermoid
Powerflex Hi-Capacity V-Belts

40% stronger
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Where more driving power is called for, switch to Powerflex Hi-Capacity V-Belts. These new *premium* belts can step up the drive capacity of "under-belted" drives by as much as 40%.

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Powerflex Hi-Capacity V-Belts are available in all standard sizes, and feature a special oil-resistant cover which prolongs belt life. Static conducting covers can be supplied. Order from your Thermoid Distributor, or write direct for complete information.

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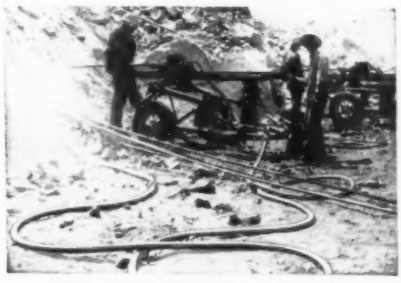

. . . and Thermoid Hose for every job.

Underground nuclear detonations may have wide application in mining.

Recent work at the Nevada Nuclear Test Site has suggested possible use of the technique in place of conventional explosives for underground blasting.

A nuclear device, housed in a room six-by-six-by-six feet, broke more than 700,000 tons of rock, and only about 700 tons were radioactive. The experiment showed that only rock immediately surrounding the core of the blast was contaminated. Balance of rock broken through subsequent shock waves was clean.

An important copper producer now plans to cooperate in experiments on a large-volume, low-grade deposit.

The Russians seem to be on a similar tack. Nuclear explosions for tunnel driving are already hinted at by Moscow radio.

Industrial mineral products are being used in new ways.

The porcelain impeller has found a place in the metallurgical industry. Installed in a centrifugal pump, it provides maximum corrosion and erosion resistance.

Barite, converted to barium hydrate, is being used as an additive to lubricants to improve heat resistance and detergent action.

An exceptionally pure grade of silicon is being produced through iodide refining for use in rectifiers, solar batteries, and transistors.

Large chemical companies and other manufacturers continually strive for development of unknown compounds derived from mineral raw materials.

Industrial mineral deposits in the West are receiving more attention.

A Nevada fluorspar property is being examined by Wah Chang Mining Corporation.

California's Trona brines are producing two new lithium chemicals on a semi-commercial scale—lithium perchlorate and lithium nitrate.

Diatomaceous earth deposits in Nevada will now support a new processing plant at Lovelock to be operated by Eagle-Picher Company.

Barite is growing in demand. Firms like Bunker Hill are being attracted by the opportunities for new applications.

Phosphate rock in Idaho will soon be processed by a new producer, Central Farmers Fertilizer Company, whose plant is under construction in Georgetown Canyon.

An important incentive for uranium prospecting passed, almost unnoticed, into mining history last month.

A $10,000 bonus was offered in 1948 by the U.S. Atomic Energy Commission for delivery to the Commission of the first 20 short tons of uranium ore assaying 20 percent U_3O_8 from any single mining location. The offer expired at midnight on April 11, 1958.

Only firm to qualify was Lisbon Uranium Corporation which delivered its ore from the Ike-Nixon property in Utah just a few hours under the deadline.

Many other minerals have been discovered, indirectly, through the uranium program. A gold property now under development in Washington, and a recent vanadium discovery in Nevada were both found by uranium prospecting parties.

What new incentive will be offered to the mining prospector?

Hold it!

you don't need a sledge on that hopper...

it's free-flowing

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No need to pound the car or break up clods with a prod. Just crack the hopper and Westvaco Soda Ash flows as fast as your conveyor can take it away.

That means faster unloading, better use of your siding, faster handling into and out of silos or bins . . . with no manual labor to keep the ash moving.

Why does Westvaco Soda Ash flow so freely? Unlike old time cube-crystal ash, Westvaco Soda Ash crystals actually are tiny, needle-like rollers that have no tendency to lump up, stick or bridge over. They flow freely the year around.

You pay no premium for the physical and chemical superiorities of Westvaco Soda Ash—free flowing, fewer fines, low iron, higher purity, to mention only a few.

Let's discuss your needs and our ability to supply them better. We may be able to help you cut costs on soda ash.

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Miners Hope Their Testimony Will Aid Secretary Seaton's Mineral Program

The Senate Interior and Insular Affairs Committee's Subcommittee on Minerals, Materials and Fuels held five days of hearings beginning March 24, 1958. Secretary of Interior Fred Seaton begged off from appearing, saying to the committee that his Long-Range Mineral Program was not far enough along to present to Congress at that time. He said he might appear April 28, 1958. If anyone knows what Secretary Seaton may propose, it is a very closely held secret.

The Interior Committee witnesses covered the entire mineral field, including coal and oil. Nothing seemed plainer to observers present at the hearings than that every segment of the mining and minerals industry is in serious trouble and that there is a wide difference of opinion as to how to correct the difficulty. Increase tariffs, quotas, and combinations of the two seemed to be the favorites; subsidies, either by direct purchase by the government at fixed above-market prices or the so-called San Francisco plan, were mentioned for certain of the strategic minerals; and combinations of tariffs, quotas, and producer payments similar to the sugar quota plan seemed to be favored by some witnesses and Senators.

It must be remembered that tariff problems are not within the jurisdiction of the Senate Interior Committee. The most that committee can do with regard to tariffs is to recommend a course of action to the Senate. Of course, any member of the committee may introduce a tariff bill which then will be referred to the Senate Finance Committee for action—but the House Ways and Means Committee must act first. Subsidies are within the jurisdiction of the Interior Committees of both the House and the Senate.

It is most likely that the Senate Interior Committee will not report on the numerous bills before it until Secretary Seaton presents his testimony. An exception might be S. J. Res. 16 which would set up a committee to study the gold question which is not, strictly speaking, a part of the Long-Range Minerals Program. There is one good thing about industry's testifying before Secretary Seaton. His long-range plans (if any) may be influenced thereby.

• "Escape Clause" Delays Are The Rule

The White House always can find some excuse for not acting upon Tariff Commission recommendations to raise tariffs under the "escape clause" provisions. The other day the President found reasons to delay action on the stainless steel flatware case for at least nine months. Now, in the umbrella-frame case, he has sent the recommendations back for a "supplemental report." Evidently the "escape clause" provides no escape from industry frustration.

• Booklet On Public Law 167 Is Available

The Department of the Interior, Bureau of Land Management, has published a useful free booklet entitled "Multiple Use on Mining Claims." This booklet answers for the miner almost every question that might be raised about the Multiple Use Act, Public Law 167 of 1955, except the $64 question. It gives no definition of that much argued-about term "common varieties."

There also is an interesting statement which certainly has curious possibilities from the miner's standpoint: "Because mining necessarily involves digging or excavating or clearing in an area, there will always be a certain amount of disturbance to the surface resources. But any such operations should be kept to a necessary minimum so as to prevent any unnecessary abuse of the surface resources."

• 50-50 For and Against

Congressional mail for and against an assessment-work moratorium is running about 50-50, according to informed sources.

• SEC Proposal May Have Some Merit

There recently has been some fuss over a proposal of the Security and Exchange Commission to put under some controls companies which were formed before 1945, the stocks of which are assessable. It appears, however, that there may be some merit in such regulations. Certain clever promoters are said to be gaining control of practically defunct old assessable mining companies, raising money by assessments and buying, or buying into, completely unrelated enterprises of so sketchy a nature that they could not normally get SEC clearance for new companies to promote the deal.

• Tariff Strategy Becomes Evident

Without any question, determined attempts will be made to attach lead-zinc and copper tariff bills to the Trade Agreements Act when it is reported by the House Ways and Means Committee. Other mineral groups may try the same tactics. The theory is, of course, that if the Trade Agreements Act is passed, even in some modified form (which seems likely), the President will accept reasonable riders rather than veto the whole bill. If attempts to saddle the trade treaties renewal bill with amendments should fail in the House, look for the same move in the Senate Finance Committee and on the Senate Floor. There will be a good deal of Administration resistance, but the moves stand some chance of success.

. . . and the loudest sigh of relief ever heard in North American waters, as mariners mark the end of deadly Ripple Rock . . . menace to navigation . . . graveyard for hundreds of sailors and ships since 1875.

"The Rock" died hard . . . demanding 2,700,000 pounds of explosives, $3,000,000 in costs, three years of work and all that goes with the planning and execution of the world's biggest non-atomic explosion.

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JOHANSSON & CIA., S.A., LA PAZ, BOLIVIA • SHRIRO TRADING COMPANY S.A., TOKYO, JAPAN • TRILLIANCE ENGINEERING CO., BOMBAY, INDIA • WIESE AND ČA. LDA., LISBON, PORTUGAL.

UPPER RIGHT: An 8-yard shovel loads waste rock blasted from the face of a 45-foot bench at Eagle Mountain Mine into a Kenworth 803-B.

The largest known rear-dump semi built today, the giant 803-B is the newest in the complete Kenworth line of rock and ore movers.

LOWER RIGHT: An 803-B dumps its load over the waste dump at the East pit. This truck is one of a fleet on the job for Kaiser Steel.

KAISER STEEL USES 64-TON 803-B's

At Eagle Mountain Mine, near Desert Center, California, where Kaiser Steel Corporation has stepped up production in the largest known body of high grade iron ore in the West, a new fleet of Kenworth 803-B rock and ore movers is in operation.

Measuring 41 feet, 11 inches from the front of its bumper to the rear of its single-axle semi-trailer, the 803-B has a GVW rating of 228,000 pounds and a rated payload capacity of 64 tons or 40 cubic yards struck. The spring-mounted tractor rides on axles of Carcometal, a special high-strength cast steel–the front axle capacity being 50,000 pounds, and the rear axle, 100,000 pounds.

On the job at Eagle Mountain Mine, the 803-B's are used chiefly for the movement of waste. Loaded by shovels at the benches, they shuttle back and forth over a half-mile route to the waste dump. Dumping action moves the tractor back and under the trailer as the entire trailer rises. A body guide and equalizer stabilizes the body during dumping. Pin-type construction of the fifth wheel also assures stability in dumping, as well as while hauling.

The men responsible for continued production at Kaiser Steel's huge open-pit operation report that ease of maintenance is one of the special advantages of the Kenworth 803-B. Because components requiring frequent or daily servicing are all grouped on one side of these trucks, routine maintenance is accomplished with less effort in shorter time. This service accessibility is combined with the over-capacity engineered into Kenworth's giant rock and ore movers, resulting in top performance.

Driver comfort and confidence have also received extra attention from Kenworth engineers in designing the 803-B. The one-man offset cab has been enlarged in all dimensions, including increased headroom. Ventilation has been improved. Maximum direct vision is provided. Power steering lessens driver fatigue by making control positive and easy and by minimizing road shock. Variable rate dual front springs, combined with rear tractor springs, not only add to driver comfort but have been found to lower tire and maintenance costs.

KENWORTH

MOTOR TRUCKS

HOME OFFICE: SEATTLE 24, U.S.A.; FACTORIES AT SEATTLE AND VANCOUVER, B.C. DISTRIBUTORS IN THE UNITED STATES AND MANY FOREIGN COUNTRIES

For drifters, sinkers and stopers...

CHIPS WASH BACK FASTER WITH NEW TIMKEN® THREADED BIT—GIVES MORE HOLE-PER-BIT

WITH this new Timken® bit you don't spend time "drilling" chips. You drill new rock because chips wash back faster. The newly-positioned five front holes shoot air or water directly against the rock face. And the deeper, wider wing clearance plus deeper relief under the heel give added clearance, help speed chip removal. This fast wash-back ends the problem of clogged drill steels, protects bit skirts, gives you more hole-per-bit.

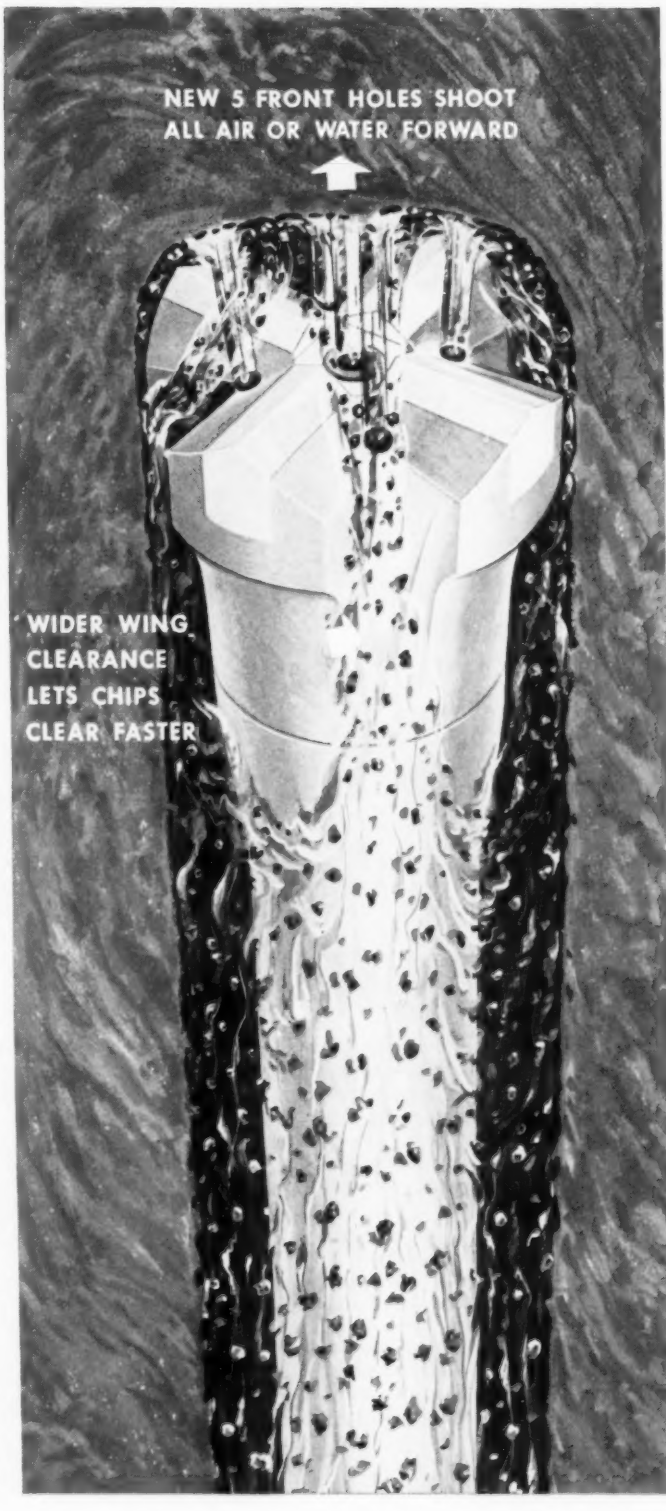
And what's more new special analysis carbides in this new Timken threaded bit give greater resistance to wear and shock. And you can recondition them many times. The redesigned heavier wing speeds drilling. Improved thread contact minimizes breakage. All these new features mean lower cost per foot-of-hole drilled.

To get more hole-per-bit on drifters, sinkers and stopers, use the new Timken threaded carbide bit. For full details, write for free brochure. The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

FOR OTHER TOUGH DRILLING JOBS

Improved Timken all-steel multi-use bit. With correct, controlled reconditioning, gives you lowest cost per foot-of-hole when you can drill full increments of steel.

New Timken tapered socket bit. Removable for full steel life. Tapered for more secure union. Has same new frontal features as threaded bit. It's the air-leg bit of the future—here today!



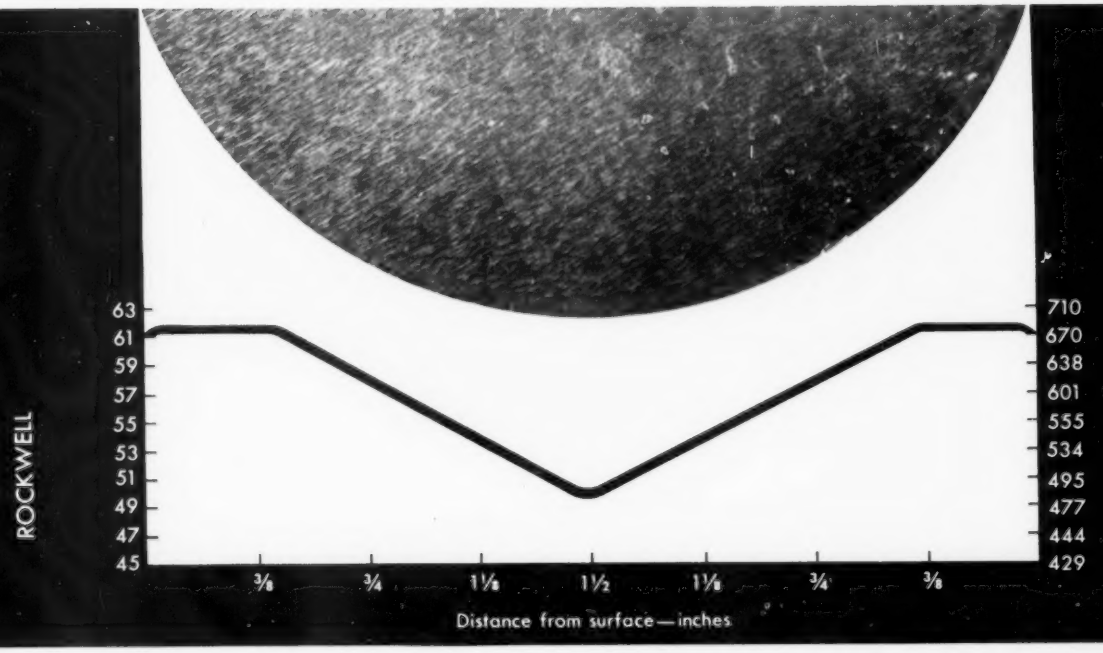
TIMKEN REMOVABLE ROCK BITS

controlled metal hardness means

heat-treated cast alloy steel

NACO GRINDING BALLS

cut per-ton grinding costs



Note how new casting process and full heat treatment show controlled hardness between surface and inner core.

Spectrographic analytical control of elements in steel making processes and controlled heat treatment assure the desired metallurgical grain structure which produce the type of hardness required for maximum wearing qualities.

Performance reports on Naco solid cast alloy steel grinding balls from mills now using them have been universally favorable—both in lasting qualities and impact absorption.

Structurally, they possess a grain closely approaching tool steel—tough, hard and rugged for long lasting qualities. Laboratory tests show a remarkable uniformity in solidity, both under X-ray and specific gravity tests, with controlled hardness holding to a desired depth.

AA-5059

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NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

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Established 1868

Exclusive P&H MAGNETORQUE® and ELECTRONIC CONTROLS put this 8 yd. P&H 1800 Electric Shovel far in front for economical, daily output in open pit mining operations.

For stripping, digging, loading P&H offers power cranes and shovels

This P&H 1055-LC is designed and balanced to handle extra long booms and larger dippers. It is performing long range mining operations at Flemington, W. Va., equipped with a 48-foot boom, 34-foot dipper stick and a 3 yd. dipper.

This 2½ yd. P&H 955A is stripping overburden near Clarksburg, West Virginia. It is equipped with *exclusive* P&H MAGNETORQUE® Electric Swing which provides smoother, faster swings—without friction—without wear.

With true, tractor-type crawlers and all-welded construction, this 1½ yd. P&H 655B withstands the repeated twists, stresses and shocks of day-long mining operations. It is a popular model for fast loading and dumping.

P&H serves all these open pit mining needs

in a wide range of capacities

P&H Independent Planetary Boom Hoist contributes to the efficient operation of this 20-ton P&H 255A-TC. Boom lowering is always done under power in handling materials at this mine siding in McDowell County, West Virginia.

THE P&H LINE:

Electric Excavators from 3½ through 10 cu. yd.
Power Excavators from ½ through 4 cu. yd.
Truck Cranes from 10 through 70-ton capacity

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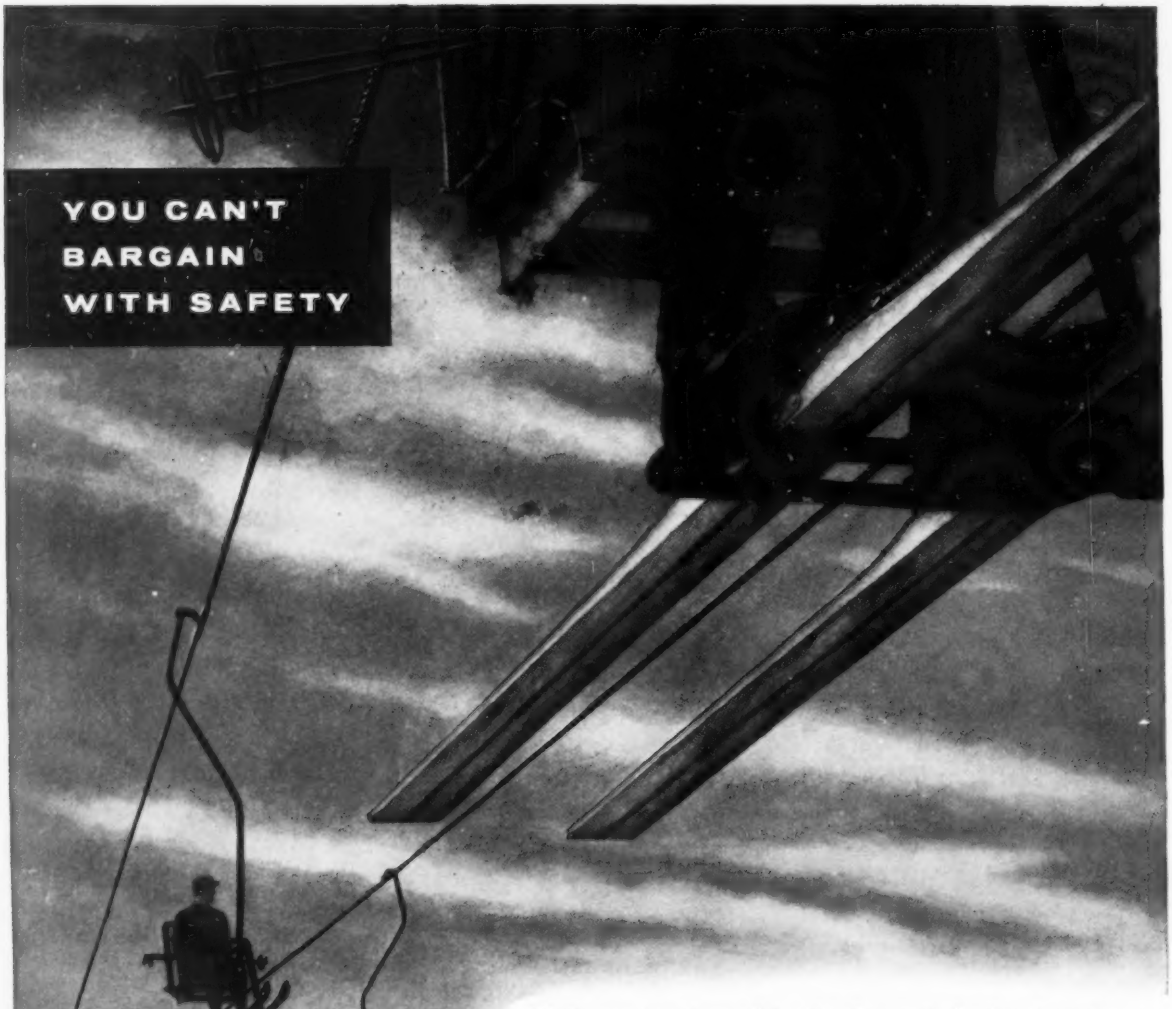
Construction & Mining Division
Milwaukee 46, Wisconsin



Ski lift operators stress safety when it comes to buying wire rope. Too many lives are at stake. So they buy . . .

A Safe Lift

Even though you don't operate a ski lift, false economy can be costly in your rope purchases, too. For a rope failure can cause personal injury . . . wreck your equipment . . . throw off your entire work schedule . . . and affect employee morale. Yes, a "bargain" wire rope may save you money, yet cost you your peace of mind. Don't take a chance. Buy a rope that's a quality rope—buy Wickwire Rope.

CF&I

WICKWIRE ROPE
A CF&I PRODUCT

LOOK FOR THE YELLOW TRIANGLE

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

5050

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CYANAMID

REAGENT NEWS

"ore-dressing ideas you can use"

600 Series AERO® Depressants --For Effective Gangue Control and Slime Depression

These time-tested reagents continue to be useful the world over as aids in the flotation of ores containing troublesome gangue slimes. The series includes AERO Depressants 610, 615, 620 and 633. Generally fed as 5% solutions, effective dosages range from 0.05 to 0.5 lb/ton of ore.

Listed below are some typical case histories outlining how the 600 Series AERO Depressants are being used to control or depress carbonaceous and talcose gangue slimes, improve selectivity and concentrate grade, and cut consumption of other flotation reagents.

Flotation of gold-bearing sulfides – 0.4 lb/ton AERO Depressant 633 effectively depresses graphitic slime, improves concentrate grade and recovery and subsequent roasting-cyanidation operations.

Lead-zinc flotation – 0.03 lb/ton AERO Depressant 633 in lead circuit and 0.04 lb/ton in zinc circuit depress actinolite and improve concentrate grades without sacrificing recovery.

Graphite flotation – Up to 1.0 lb/ton AERO Depressant 633 slows down graphite flotation helping to prevent over-flocculation and mechanical entrapment of gangue.

Pyrite flotation – Use of 0.072 lb/ton AERO Depressant 620 keeps down talcose slimes at gold-uranium operation. Required pyrite concentrate grade not attainable without AERO Depressant 620.

Copper-zinc-gold – Combination of AERO Depressants 615 and 620 at approximately 0.4 to 0.5 lb/ton, together with SO_2 solution (about 0.2 lb/ton S), depresses talc and chlorite gangue in copper circuit. Zinc is floated from copper tailings without addition of 615 or 620. Zinc tailings are leached with AERO® Brand Cyanide for gold recovery.

Lead-zinc flotation – AERO Depressant 610 at 0.05 lb/ton improves selectivity of zinc float by depressing gangue, loosening froth and improving concentrate grade.

A Cyanamid field engineer will be glad to discuss the possible application of these products in your flotation operation.

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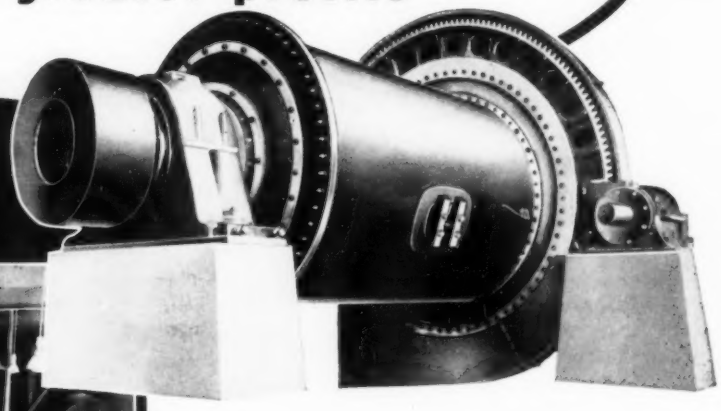
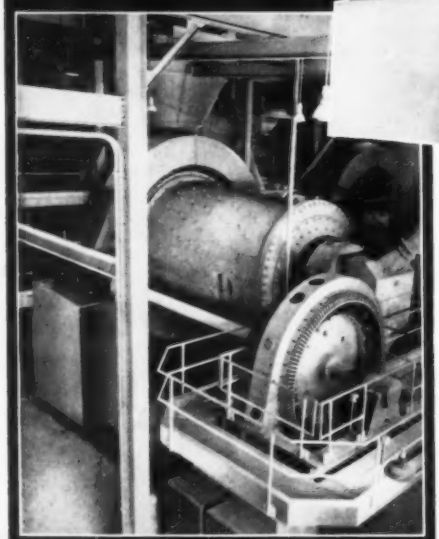
Traylor-MADE
BALL MILLS
for greater profits





Traylor Ball Mills are made in two types—overflow and diaphragm discharge. They are built for either wet or dry grinding.

- **Shell Liners** — are of manganese or high carbon steel in plain, wave, cascade, lifter or Lorain types.
- **Shells and Trunnions** — shells of welded steel construction. Trunnions are cast integrally with the detachable heads.
- **Main Bearings** — made of Meehanite* metal, larger sizes fitted with a high pressure Alemite pump.
- **Driving Gears** — are steel, precision-cut on our Maag gear generator.

Traylor Grinding Mills are available in Ball, Rod Compartment and Tube Mills. Write for bulletin No. 11-121 today!

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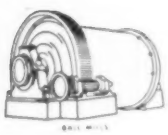
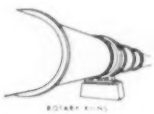
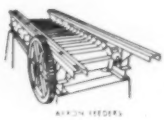
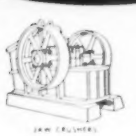
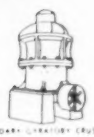
Traylor

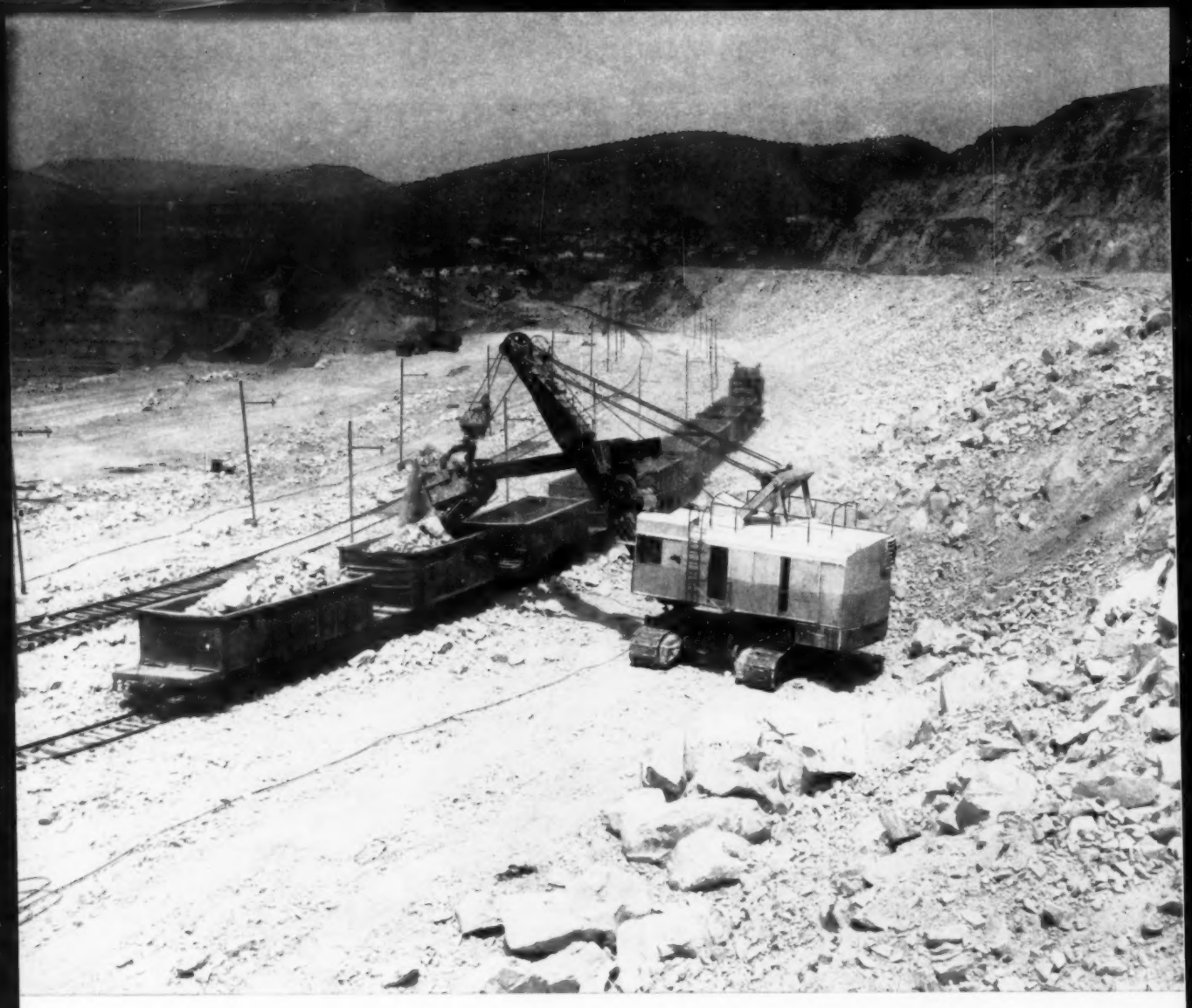












Rugged Rock Work

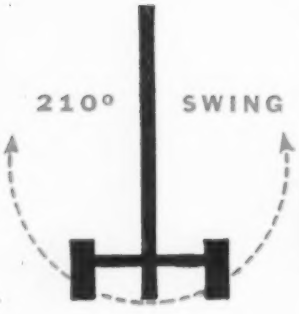
Hard, abrasive rock is the supreme test of a power shovel's ability. Eight Marion 4161's like this one, with 5-yard dippers, load broken rock around the clock in an open pit copper mine of southwestern New Mexico. Each machine handles up to 5000 tons of waste rock and ore in an eight-hour shift.

Marion's extensive line includes the 1½-yard 362 shovel, shown here loading bank-run sand and gravel at the pit of an Ohio firm. Modern heavy-duty construction of this machine matches that of larger Marions.

CONSULT **MARION** *MINING SPECIALISTS*
for lowest costs on your property!

MARION POWER SHOVEL COMPANY—MARION, OHIO, U. S. A.

A Division of Universal Marion Corporation



Sit down . . . move in . . . drill . . . drive on with Gardner-Denver Deluxe "Air Trac"

. . . everything you need for fast, effortless blast hole drilling is at your finger tips. Centralized hydraulic remote controls give instantaneous command of all operations. You can swing, lift and lower drilling mast into position . . . drill . . . and drive crawler tracks without getting off the rig.

Gardner-Denver DPAT hydraulic drill positioner provides 210° swing, 360° dump. You'll have an 86° T-bar lift. All vertical, horizontal and flat lifter holes can be completely power-positioned. The hydraulic system is creep-free, maintains alignment at all drilling angles, avoids stuck steel.

Deluxe "Air Trac"® is equipped with hard-hitting, fast-acting DH123 (4½") or DH99 (4") drill . . . free-wheeling drive shaft for towing . . . toolbox for tool, bit and coupler storage. Climb aboard and test the Deluxe "Air Trac" at your nearest Gardner-Denver distributor's today.

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IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

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Maple St., Small Town, U.S.A.

A TOWN WHERE

"NOTHING EVER HAPPENS"...

A home town—like your town. A place where people said "it couldn't happen to us."

But it *did*. Like a whip, a great tornado lashed down Maple Street, splintering houses, leaving people hurt—homeless—panic-stricken.

A desperate call went out for the Red Cross and quickly, automatically, the team went into action.

Red Cross nurses slipped into uniform . . . volunteers set up first aid stations . . . canteens fed the hungry. Later, Red Cross money and work helped rebuild the town.

Last year was one of the worst disaster years of this century, and the year before, 1956, was almost as bad. Every month and in every state, the Red Cross strained to the limit as hurricanes, floods, tornadoes, forest fires swept across the country.

Red Cross receives no government funds—depends entirely upon *you* for support. Give as much as you can. Your dollars may go to your own town when it needs them most.

Join and Serve

MINING WORLD

"TAKE IT FROM ME... International® crawler is 'toughest', faster...for manganese mining!"

BRYON J. PHEGLEY, Superintendent, Duncan Mining Company

The authority of long experience with other leading makes of track-type tractors, backs the statement by Bryon J. Phegley, superintendent for Duncan Mining Company, Mena, Arkansas.

"I have been mining for 28 years," states Mr. Phegley, "but I don't know of any rougher tractor work than this. The International tractor is toughest and much faster than others I've used. It gives very good service."

Blasting brings down boulders that stump the ¾ cu yd shovel and block the haulers. The boss simply calls in their dozer-equipped TD-18. And in 15 minutes, or so, the pit face is clean, the haul road clear, so manganese ore mining can be resumed.

Rock-shock imposes tremendous impact loads on track frames. That's where box-section track frames, inside braced with inch-thick steel prove their stuff!

Powdery grit particles, as abrasive as grinding compound, gnaw at track parts. Electronic hardening puts a deep wear-fighting armor on track links. International track roller seals do a positive job of excluding grit from bearings—besides extending lubrication intervals up to 50 days!

Features like these are why the International crawler gives amazingly dependable performance—handling key jobs that help the mine profitably produce 1,000 tons of manganese ore per week!

For your own profit and satisfaction, discover why so many quarry-men and miners are switching to International crawlers — especially for the tough jobs like rock-moving. See your International Construction Equipment Distributor for a demonstration!

After pit clean-up, the International crawler resumes moving truck-hauled overburden out of the way. In addition to these jobs, the big crawler maintains haul roads.

Typical extra assignment for the International crawler: carving out a new haul road into the pit to reach a new vein of manganese 30 ft. below the level of the present pit floor. This road is to be 225 ft. long, 30 ft. deep, and 30 ft. wide.

International®
Construction
Equipment

International Harvester Co.,
180 North Michigan Ave., Chicago 1, Ill.
A COMPLETE POWER PACKAGE:
Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

One of Duncan Mining's toughest jobs is clean-up after blasting. Their International crawler easily muscles the king-size boulders and chunks of shale from the pit to overburden dump.

"T-1" Steel cuts cost of truck liners 75%

—doubles their life

Dumping a 41-ton load in 10 seconds causes terrific abrasive and scouring action. USS "T-1" Steel gave double the life under these conditions.

Five 26-cubic-yard dump trucks hauling copper ore were lined with USS "T-1" Steel plates more than a year ago. These have been in service at the Copper Cities Division of Miami Copper Company mines at Miami, Arizona.

None of the USS "T-1" Steel liner plates has worn out yet, according to the Acting Master Mechanic. What's more, the old liners became dented and jammed by the impact from large chunks of ore and it was necessary to un-jam them to get them out. Now, by using USS "T-1" Steel plates furnished to a minimum of 321 Brinell hardness, impact is no longer a serious problem.

USS "T-1" Steel offers a combination of advantages not found in any other steel. It has a minimum yield strength of 90,000 psi, almost three times that of structural carbon steel. It has high resistance to impact abrasion, can be formed and welded, and retains its strength after welding—even when used at temperatures as low as -50° Fahrenheit.

Why not get the complete story? Write for our free book containing technical data and practical application stories. United States Steel Corporation, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

Remember that we also make USS COR-TEN, MAN-TEN and TRI-TEN high-strength low-alloy steels—standards for heavy-duty equipment.

USS, Cor-Ten, Man-Ten, Tri-Ten, and "T-1" are registered trademarks

3,877,880 tons of rock were hauled by five trucks like this in less than 10 months.

United States Steel Corporation – Pittsburgh
Columbia-Geneva Steel – San Francisco
Tennessee Coal & Iron – Fairfield, Alabama
United States Steel Supply – Warehouse Distributors
United States Steel Export Company

United States Steel

BUILT FOR BOULDER BUSTING BRUTES

Stop breakage problems on every kind of earthmoving job with tough, rugged *ESCO* Cast 12M Dozer Cutting Edges. *ESCO* Cast 12M Cutting Edges can take the severe punishment of longer pushes and rougher pioneering, even on the largest machines.

Careful heat treating of this *ESCO* steel alloy, 12M, makes *ESCO* Cutting Edges extra tough and hard *all the way through*. And, the same qualities that insure this breakage resistant toughness also impart amazingly high wear resistance.

You've really got the edge for low cost earthmoving and pioneering with *ESCO* Cast 12M Dozer Cutting Edges. Call your nearest *ESCO* dealer today for details.

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IN CANADA ESCO LIMITED

This Bucyrus-Erie is loading iron ore out of The Mesaba-Cliffs Mining Company's Holman mine, which is operated by The Cleveland-Cliffs Iron Company.

What Makes Bucyrus-Eries Tops on the Range?

There are more Bucyrus-Eries — new ones, middle-aged ones and old ones — working on the Mesabi and Upper Peninsula Iron Ranges than all other excavators combined. According to a recent survey, 2 out of every 3 yards of ore and overburden excavated in these ranges are handled by Bucyrus-Eries. There must be reasons.

There is no better reason than performance — and no substitute for it, either. This performance is reflected in Bucyrus-Erie high-production digging features. The twin-dual hoist concentrates power wherever needed for digging — divides the load for longer rope life. Modern front-end design with two-section boom provides strength, less deadweight for more payload. Bucyrus-Erie improved Ward Leonard variable-voltage control provides instant response; fast acceleration and deceleration, extra torque when needed.

Bucyrus-Erie top performance can be yours for better mining. Why not take advantage of it? Write or wire for details on these electric excavators to fill your needs — the 4½-yd. 110-B, the 6-yd. 150-B and the 8-yd. 190-B. 195L58C

A Familiar Sign . . . BUCYRUS ERIE *. . . at Scenes of Progress*

BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WISCONSIN

"We bought 1 Tournatractor® to replace 2 crawlers"

says pit manager James W. MacDonald

At their Lynchburg Stone Division Pit in Concord, Va., U.S.A., Rockydale Quarries Corporation produces up to 2,000 tons of crushed limestone daily. To meet production requirements, 2 crawler-tractors were used on scattered maintenance assignments around the pit and plant. Since distances between tractor jobs ranged up to ½ mi. the slow-moving crawlers lost valuable work-time in traveling job-to-job. In addition a large amount of track maintenance was necessary because of the travel distances over abrasive footing.

So Rockydale Quarries looked for a more economical type of tractor. They found it in the rubber-tired LeTourneau-Westinghouse Tournatractor. Says pit manager James W. MacDonald, *"We bought 1 Tournatractor to replace 2 crawlers, and also to reduce track repair costs. It is very successful. We like its speed and versatility."*

Tournatractor quickly clears blasted rocks from the watery pit floor. Operator Rodney Arthur says, "Tournatractor is easy to operate. It is powerful, operates at a fast speed. Crawlers needed 16 minutes to go from pit to plant, but with Tournatractor it takes only 2 or 3 minutes!"

All-around handyman tool

Lynchburg Stone Division Pit uses their Tournatractor, equipped with 14'10" long Angledozer blade, as an all-around handyman tool (note sketch). This speedy, rubber-tired tractor cleans up after blasts and around shovels. It handles general dozing, moves wagon-drills on the pit rim, assists stalled trucks, and maintains the stockpile. When the shovel at the plant is being repaired, the Tournatractor pushes rocks from the surge pile to the hopper, to insure uninterrupted plant production. This rubber-tired tractor also is used to push-load the pit's D Tournapull scraper on stripping and road-building operations.

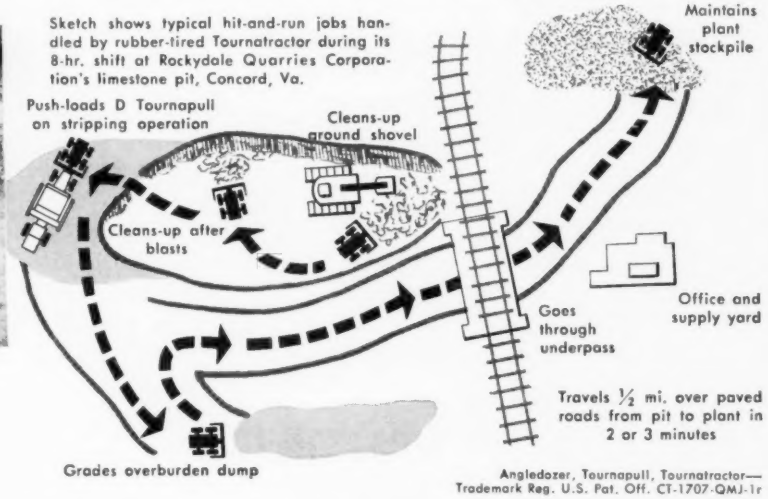
Commented pit foreman Jabe S. Ferguson, Jr., "Our work is strung out between quarry, plant, and stripping-ends on the quarry rim. The Tournatractor hurries back and forth, works all over the place. It does a good job."

Try Tournatractor at your pit

If your pit operation is widely scattered or involves abrasive material, why not investigate the rubber-tired LeTourneau-Westinghouse 210 hp Tournatractor? You will find this speedy tractor completes scattered jobs faster, at lower cost. We shall be pleased to send you more information promptly on receipt of your request.

Between dozing assignments, this Tournatractor push-loads a 7½ yd D Tournapull (new "D" has 9-yd capacity) with red and blue clay overburden. The pit also owns a L-W Rear-Dump hauler which is easily interchanged with the scraper, behind the "D" prime-mover.

Sketch shows typical hit-and-run jobs handled by rubber-tired Tournatractor during its 8-hr. shift at Rockydale Quarries Corporation's limestone pit, Concord, Va.


Maintains plant stockpile
Push-loads D Tournapull on stripping operation
Cleans-up around shovel
Cleans-up after blasts
Office and supply yard
Goes through underpass
Travels ½ mi. over paved roads from pit to plant in 2 or 3 minutes
Grades overburden dump

Angledozer, Tournapull, Tournatractor—Trademark Reg. U.S. Pat. Off. CT-1707-QMJ-1r

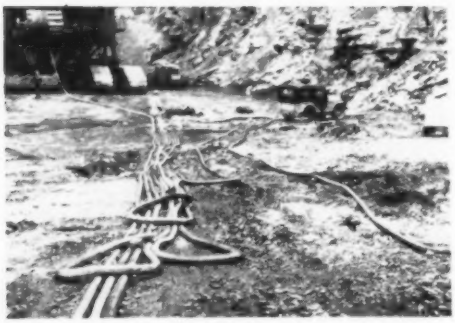
LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

GENERAL CABLE

SUPER SERVICE
PORTABLE POWER CABLE



KEEPS THIS 2900-TON SHOVEL ON THE JOB

Simco-Peabody Coal Company's mammoth Marion Type 5760 shovel, shown in operation at Coshocton, Ohio, proves once again that General Cable's Super Service Portable Power and Mining Cable can really take it under severe operating conditions. All Super Service cables have an extra-heavy-duty, mold-vulcanized *Supertuf* neoprene sheath that offers unequalled resistance to mechanical abuse, weathering, flame, oils, acids, and alkalis.

Cable that can stand up to this sort of treatment is a necessity wherever service interruptions can be costly. There's a complete line of General Cable portable power cables from 600V to 15KV, all constructed to keep your equipment on the job when the going is tough. Contact the General Cable Specialist at your nearest General Cable Sales Office and Distributing Center for complete information.

GENERAL CABLE CORPORATION, 420 Lexington Ave., New York 17
Offices and Distributing Centers Coast-to-Coast

for quality and service... **specify GENERAL CABLE**

Shaft entrance is so narrow, hauler must turn around in entrance area, then back in. Wagon-type steer permits full 90° turns, continuous U-turns in less than machine length.

Rhodesian mine reduces hauling costs 65% . . . 1 Rear-Dump now does work of 5 trucks

Dumping is fast because bowl action is powered by electricity, controlled by simple electric switch. Tapered bowl sheds contents rapidly. Note, too, how material is cast out and away, because bowl-lip swings deep behind rear wheels.

Replacing 5 hauling units with just one has saved 65% in operation and maintenance costs at a copper mine in Northern Rhodesia. *There was no loss in production.*

Until a 10-metric-ton (11-ton) Tournapull® Rear-Dump was acquired, 5 dump trucks hauled waste rock from the mine head to dump areas. Although rated as 4.5-metric-ton (5-ton) units, the trucks could carry loads only half that size, because of excessive spring breakage. And overall wear on the units was so extreme, an average of three trucks per year had to be replaced.

How new hauler reduced upkeep cost

Maintenance has proved far less costly with the sturdy Tournapull Rear-Dump. Its heavy steel-plate bowl, with box-beam ribs, easily withstands the shock of sudden loading. It resists denting, breaking, and abrasion. Big, low-pressure tires smooth out shocks and vibrations. And the expensive spring replacement problem has been eliminated: the Tournapull Rear-Dump needs no springs and therefore has none!

825 m (2700 ft.) cycles in 3.6 min.

Working 8 hours daily, six days a week, the Tournapull moves 18,200 metric tons (20,000 tons) of waste per month — maintaining the same schedules as the entire fleet of 5 haulers it replaced. It completes 825 m (2700 ft.) load-haul-and-dump cycles in only 3.6 minutes.

Fast, sturdy Tournapull Rear-Dumps are available with capacities of 10, 20, and 32 metric tons (11, 22, 35 tons). Ask for more data about them and other LeTourneau-Westinghouse machines.

DR-1752-QMJ-1m

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

Another Mining Company

This is a new important mining operation that is taking advantage of the cost saving benefits made possible by the Gismo Self-Loading Transport. The Jefferson City Mine of The New Jersey Zinc Company is an example of the result that can be obtained by careful planning, design and selection of equipment.

This Gismo machine makes it possible for you to devise and organize a simple mining method. We believe the lowest cost possible is obtained when your plan provides for the fewest pieces of equipment, supplies and men. The Gismo is simple, versatile — mucks in development or production, can drill as a jumbo, make its own roadways, etc. It can transfer its load direct to cars by means of ramp cars . . . or direct to cars or trucks by means of ramping-over (see circled photo at right) . . . or direct to surge pocket for transfer to a common haulage system or method.

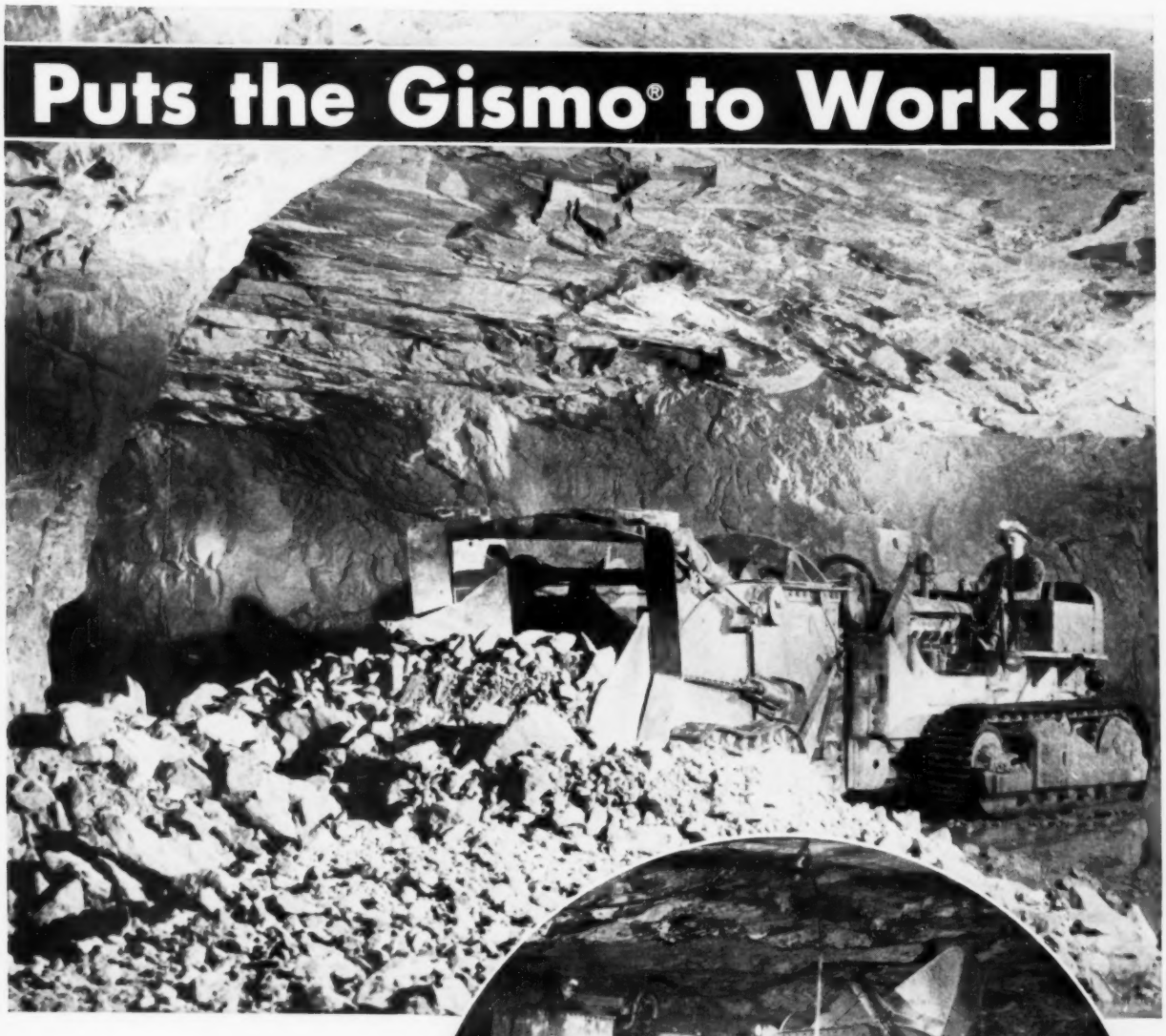
Investigate the extraordinary economies that have been obtained with the use of this remarkable machine. Its principle provides you with a new fundamental opportunity to devise ways and means of cutting costs that you have not had for many years. Write us today. Sanford-Day Iron Works, Inc., Knoxville, Tenn.

SANFORD-DAY

KNOXVILLE, TENNESSEE

SUPER MARKET FOR MINE CARS — all types . . . PRECISION WHEELS . . . BROWNIE HOISTS . . . GISMO SELF-LOADING TRANSPORT that loads in development or production . . . transports . . . supports 2 to 5 jib mounted drills . . . back fills . . . moves boulder rocks . . . makes its own roadways and cleans up completely — a new method of hard rock mining offering a tremendous reduction in cost per ton!

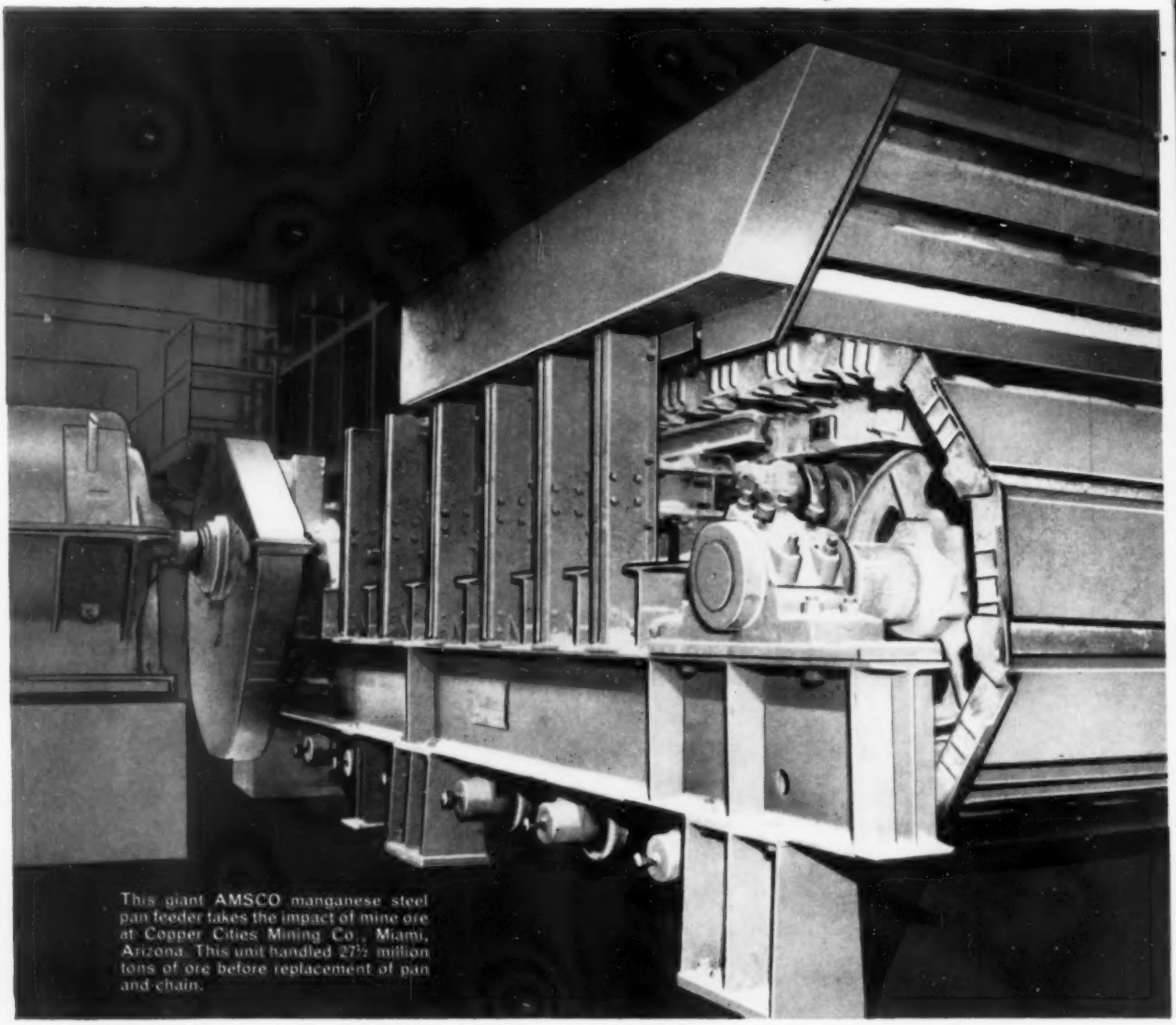
Puts the Gismo® to Work!



THE NEW JERSEY ZINC COMPANY'S Jefferson City Mine incorporates the latest and most modern equipment, including the Gismo, S-D Ore Cars and S-D "Brownie" Hoist. Above you see the Gismo mucking out a load. Circled photo at right shows the ramp-over-cars' transfer point. One man, the Gismo operator, handles the entire operation by means of push-button control of the S-D "Brownie" Hoist. Operator's control lever is located just below roof above the ramp. The S-D "Brownie" Hoist automatically moves trip when another empty car is positioned under ramp. Operating arm located beside cars "tells" hoist when to stop the trip. The S-D Ore Cars haul production to ore pass.

STEPHENS-

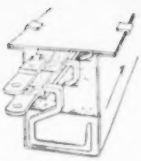
heavy duty ahead



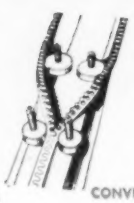
This giant AMSCO manganese steel pan feeder takes the impact of mine ore at Copper Cities Mining Co., Miami, Arizona. This unit handled 27½ million tons of ore before replacement of pan and chain.

BELT CONVEYORS

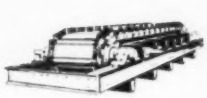
VIBRATING CONVEYORS



REDLER
CONVEYORS, ELEVATORS



ZIPPER
CONVEYOR-ELEVATORS



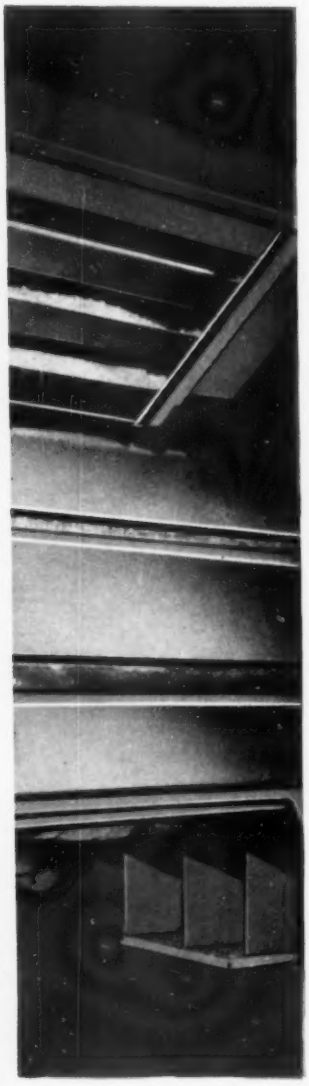
PAN CONVEYORS

BUCKET
ELEVATORS

BIN GATES-
ALL KINDS

-ADAMSON

for your ore conveyor system

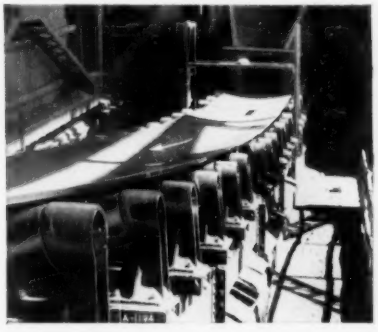


How will you move a lot of ore under or over the ground, thru processing, in and out of storage, to and from shipping—move it fast, at the least cost?

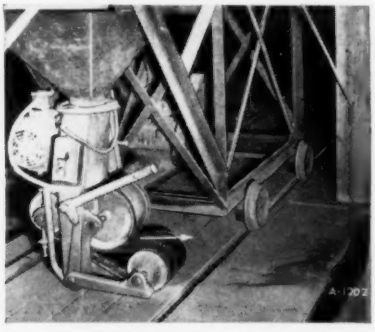
Mechanization is the way, the S-A way, and it's done by close prior study of your requirements by the best engineering brains in the bulk material conveying industry. These men are backed by a quality line of material handling and conveying equipment designed to move any type of ore in any quantity.

Long range planning of your ore handling needs is important. This calls for a conveyor system engineered for the years to come. You can find these kind of STEPHENS-ADAMSON systems everywhere in the world, moving all kinds of ore products at rock bottom cost.

Wherever you are, S-A engineers can design, build and install your conveyor system. They are available to work with your engineers or with your consultants.



A South American copper mine has been using an S-A system for 25 years. The original installation totals 18,485 feet and in terms of ore delivered is in the multimillion ton class. Six Amsco feeders are included in the system. S-A carriers, probably the largest ever built, weigh almost 1000 lbs. each.

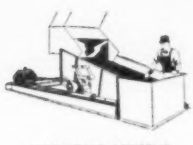


Handling a wide variety of zinc ores, a complete S-A system conveys to storage by means of feeders, bucket elevator, shuttle conveyor, and centrifugal pilers. SACO speed reducers are used on all conveyor drives and spring type belt wipers keep belt surfaces clean. Close-up here shows centrifugal thrower.

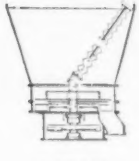
SINCE 1901 S-A STEPHENS-ADAMSON MFG. CO.

STEPHENS-ADAMSON MFG. CO.

13 RIDGEWAY AVENUE, AURORA, ILLINOIS
LOS ANGELES, CALIFORNIA
BELLEVILLE, ONTARIO



VIBRATING SCREENS



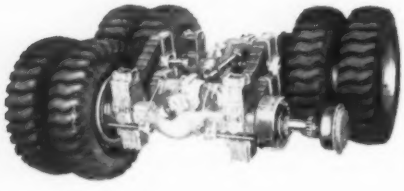
CIRCULAR BIN DISCHARGERS

SEALMASTER BALL BEARING UNITS

S-A manufactures a wide range of material handling products in three complete plants in U. S. and Canada.

- Belt Conveyors
- Belt, Pan & Plate Feeders
- Ship Loading Boom Conveyors
- Stacking Conveyors
- Storage & Reclaiming Systems
- "Natural Frequency" Vibrating Conveyors
- REDLER Conveyor-Elevators
- ZIPPER Conveyor-Elevators
- Conveyor Belt Cleaners
- Headshaft Holdbacks
- Grizzlies & Screens
- Centrifugal Pilers
- Bin Gates & Tunnel Gates
- Car Pullers & Spotters
- Bucket Elevators
- Skip Hoists
- SEALMASTER Ball Bearing Units

• *Write for a bulletin on any of the above products.*



Macks have the easy maneuverability that allows faster spotting and dumping . . . the power and brawn to move the heaviest loads over rough terrain or open highway. And Mack's Balanced Bogie with Power Divider (that applies torque to the wheels with traction) makes Macks all-weather, all-terrain performers.

Shovel-hustlers

You can speed up your loading-dumping cycles with shovel-hustling Mack trucks. Only Mack offers you a heavy-duty unit that is engineered for every hauling job. From versatile 7-ton jobs to big-capacity 15-ton jobs, on up to burly, super-capacity 34-ton models, there's a Mack that will do your toughest, most demanding hauling job best. Your Mack distributor will be glad to show you on-the-job proof why Mack's minimum down time, low maintenance costs and economical performance mean a more profitable operation for you. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

MACK

first name for

TRUCKS

Mining World

THE IMPORTANT MINING MAGAZINE EVERYWHERE

May 1958

INTERNATIONAL PANORAMA

EUREKA, NEVADA—Union Carbide Nuclear Company has taken a lease and option on a large block of vanadium claims south of here.

RUM JUNGLE, AUSTRALIA—The uranium mill of Territory Enterprises Proprietary Ltd. produced 541,652 pounds of uranium oxide in 1957. This is one of Australia's major mills.

RIVERTON, WYOMING—Fremont Minerals, Inc's. new uranium mill, scheduled for operation in December, will incorporate acid leach and carbonate leach circuits. Solvent extraction will recover uranium.

SAN FRANCISCO, CALIFORNIA—Utah Construction Company's subsidiary—Marcona Mining Company—has borrowed $10,000,000 from the Export-Import Bank as part of the $25,500-000 Marcona is spending to increase iron ore production and build a beneficiation plant at its iron mine in southern Peru.

ST. AUGUSTINE, FLORIDA—The Inter-Continental Engineering & Export Company has received authority from the Florida State Cabinet to mine titanium minerals from northeastern Florida coastal sands. As a term of the lease the firm must build and operate at least a $25,000 plant within a year.

CLIMAX, COLORADO—Climax Molybdenum Company has placed its new byproduct plant in operation. The new and enlarged plant recovers tungsten, tin, and pyrite from molybdenum tailing.

SPOKANE, WASHINGTON—Northwest Uranium Mines, Inc. will open pit its uranium deposit north of here to mine an estimated 200,000 tons of 0.20 percent U_3O_8 ore.

COBALT, IDAHO—Howe Sound Company, leading United States cobalt producer, and Haile Mines Inc., leading tungsten and manganese miner, have made plans to merge Howe Sound Company will be the name of new firm.

WASHINGTON, D. C.—The long-term objective for stockpiling zinc in the strategic stockpile has been reached. This means the federal government will purchase no more zinc for this stockpile. The lead objective is scheduled to be reached soon.

LANDER, WYOMING—Camp Bird, Limited, an English firm with world-wide base and precious metal holdings, has optioned its first major uranium properties. They are the Gas Hills claims of Two States Uranium Corporation and Valley Dean Corporation.

MERRITT, BRITISH COLUMBIA—Diamond drill hole No. 15, drilled vertically from the surface by Craigmont Mines, has averaged 4.20 percent copper from a depth of 170 to 710 feet. The hole was collared in the center of an anomaly discovered by geophysics.

SAN FRANCISCO, CALIFORNIA—The United States Atomic Energy Commission has announced that five domestic areas have inadequate uranium milling facilities and that additional and new milling contracts are anticipated for 600 tons per day in southeast Texas, 600 for Black Hills lignites, 1,700 for Wyoming, 200 for Colorado Front Range, and 200 for Austin, Nevada.

ANTOFAGASTA, CHILE—Three American banks and the International Finance Corporation are loaning $6,400,000 to Minera de Mantos Blancos S. A. to finance a 2,000-ton-per-day copper mine, mill, and smelter. International Finance is loaning $2,200,000; American Overseas Finance Company $2,000,000; Bank of America (International) $1,600-000; and J. Henry Schroeder Banking Corporation $600,000.

MOSCOW, USSR—Copper is found in three main types of deposits in Russia: as chalcopyrite in mixed sulphides, in copper-molybdenite veins, and in copper-bearing conglomerates.

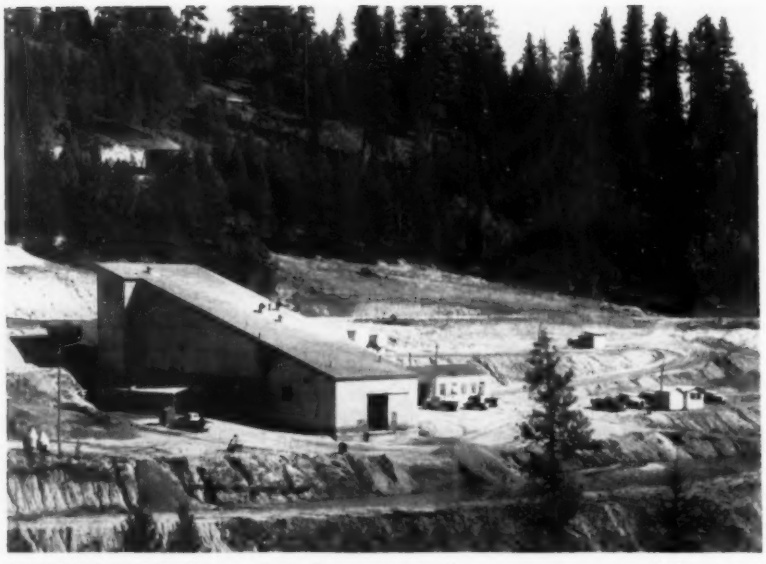
St. Joe Developing Second Major Missouri Lead Belt

A new lead district is being developed near Viburnum, Missouri where St. Joseph Lead Company has started a full-scale shaft sinking operation. The first pay hole was drilled in Crawford County in 1955 and presently there are nine diamond drills and 20 churn drills exploring the area. Preliminary work on No. 27 shaft started in September 1957 and full-scale sinking is now underway. Aerial survey maps are being used to plan other shaft sites (four may be necessary to mine the deposit), the mill site, tailing disposal area, power lines, roadways, and a townsite. It may take five years and $15,000,000 to bring this district into major production.

As the map shows, Viburnum is located where Washington, Crawford, and Iron counties join.

Also on the map is the location of Pea Ridge where St. Joseph Lead and Bethlehem Steel Corporation are sponsoring an iron ore project under the management of Meramec Mining Company. With an eventual capacity of 2,000,000 tons of pellets annually, the project is expected to go into production in the latter part of 1962. Additional drilling in 1957 indicated very large reserves of 60 to 65 percent iron ore and confirmed the original estimates on which the project was established. This high-grade iron ore will be beneficiated to remove impurities and raise grade of pellets to 71-percent-plus iron, making one of the world's highest grade iron concentrates.

A 23-mile railroad is to be built from Cadet on the main line of the Missouri Pacific Railroad to Pea Ridge, and dock facilities may be installed for loading barges on the Mississippi River. The town of Sullivan is close enough to serve as the townsite for the project. Union Electric Company has completed two 138,000-volt transmission lines to the plant site.



UNUSUAL MILL of Porter Bros. Corporation produces over 99 percent of the United States' output of columbium-tantalum concentrate by a combination of electro-magnetic, high tension and gravity separation methods.

Metallurgical Data
Porter Bros. Corp. Mill
Lowman, Idaho

Metallurgical Recovery:
88.44 percent

Main Products Recovered:
Columbite-euxenite
Monazite

By-products Stockpiled in Form Recovered Include:
Ilmenite
Magnetite
Zircon
Garnet

Screen Analysis of Mill Feed:

+10 mesh	1.6 percent
−14	7.6
−28	33.6
−35	17.6
−48	19.0
−65	12.0
−65	8.6
	100.0 percent

Radioactive Black Sand Is Yielding Columbite Concentrate at Idaho Mill

By STANLEY H. DAYTON
Associate Editor

Porter Bros. Corporation's unusual and highly strategic 150 to 200-ton-per-day mill at Lowman, Idaho is currently processing over 99 percent of our domestic columbium-tantalum output. The plant was put into operation in 1955, 72 miles northeast of Boise. Treatment involves electro-magnetic, high tension and gravity beneficiation of jig-concentrated black sands which carry euxenite, a rare earth of the yttrium group containing columbium, tantalum and uranium. The black sands are recovered by Porter Bros. Corporation dredging operation at Bear Valley, Idaho.

The novel Lowman plant is turning out two main products—a columbite-euxenite and a monazite concentrate—plus a host of potentially valuable by-products, such as magnetite, ilmenite, zircon, and garnet. Mill feed is obtained from a long overlooked source—placer deposits in Central Idaho. Overlooked, that is, until Porter Bros. Corporation happened along with the necessary vision, courage, and experience to develop the placers for the strategic mineral content. (See January 1958 MINING WORLD for a description of the dredging operation.)

Since 1955, Porter Bros. Corporation has been dredging gravels at Bear Valley, 20 miles north of Lowman, to recover heavy minerals. The sands recovered contain a wide range of minerals including: euxenite, fergusonite, brannerite, xenotime, monazite, ilmenite, garnet, zircon, columbite, and ilmenorutile. Euxenite is found in amounts of 1.0 pound-per-yard; columbite averages 0.2 pound-per-yard; monazite occurrence is 0.5 pound-per-yard, and magnetite, ilmenite, and garnet make up 85 percent of the remainder.

Mineral Separation

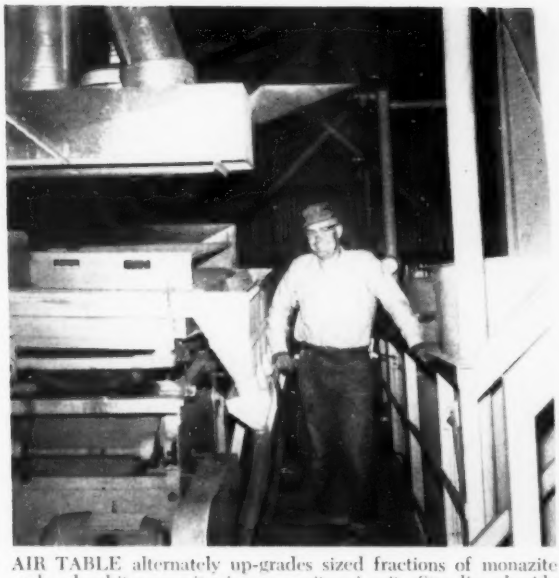
Physical properties of the above heavy minerals overlap in many cases; hence, it is necessary to resort to a combination of methods to recover the valuable products. Essentially electro-magnetic separation is used to scalp out minerals of high magnetic susceptibility, such as magnetite and ilmenite. Subsequently monazite and columbite-euxenite are separated by high tension means. Air tabling and wet tabling are then used to up-grade the high-tension concentrates.

Basically, the milling process consists of a wet circuit and a dry circuit. In the wet portion of the plant, blended black sand is rod-milled to minus-0.064-inch size (about minus 12-mesh Tyler) and the major portion of the magnetite is removed by a Stearns MWI, Crockett-type electro-magnetic separator. Two Dorr 2- by 15-foot classifiers deslime the feed, removing 2.70 specific gravity solids at minus-65 mesh from the black sands.

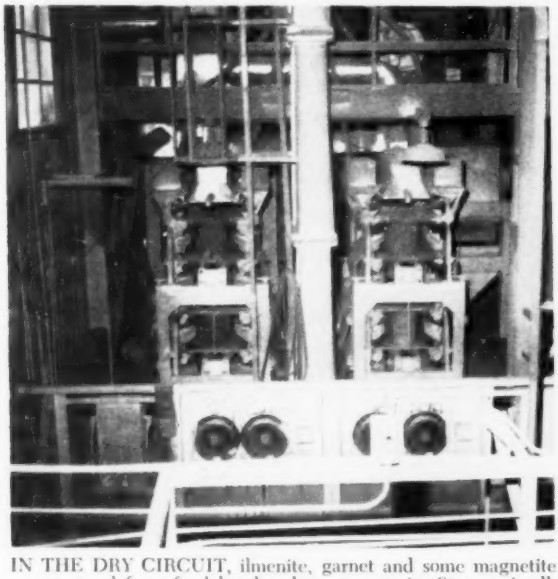
In the dry circuit, ilmenite, garnet, and a small amount of magnetite are first removed by two, twin Stearns four-roll, induced roll separators. A bulk columbite-euxenite product is separated from monazite in a Carpco HT 460, four-roll, high tension separator. Columbite-euxenite and monazite are then separately and alternately treated, after being split into plus- and minus-0.028-inch size fractions, in a single gravity concentration circuit consisting of an air tabling and a wet tabling operation.

Concentrate Destination

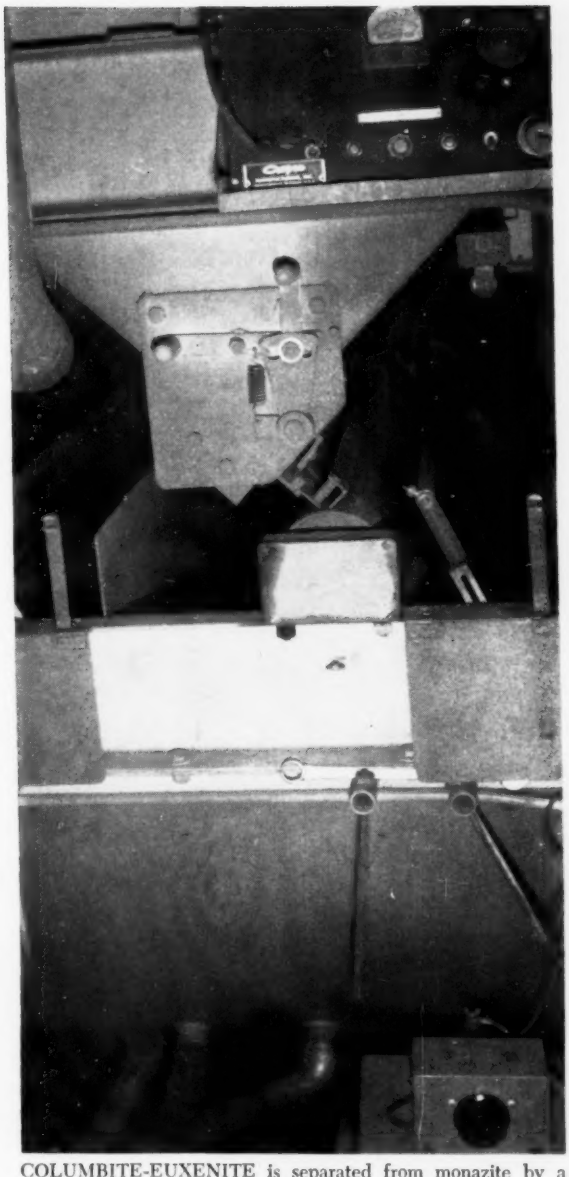
Mallinckrodt Chemical Works treats the concentrates on a toll basis for Porter Bros. Corporation. Recovered at the Mallinckrodt plant are columbium and tantalum pentoxides, uranium oxide and rare earth, titanium and thorium-iron residues.



AIR TABLE alternately up-grades sized fractions of monazite and columbite-euxenite in a gravity circuit. Standing beside table is Al Rose, mill superintendent.



IN THE DRY CIRCUIT, ilmenite, garnet and some magnetite are removed from feed by the above two, twin, Stearns 4-roll, electromagnetic separators.



COLUMBITE-EUXENITE is separated from monazite by a Carpco HT 460 high-tension separator. Above photo shows one roll of the 4-roll assembly at the Lowman mill.

Porter Bros. Corporation holds a contract with the Atomic Energy Commission for the sale of the uranium oxide. It holds a contract with the General Services Administration covering the sale of the columbium-tantalum pentoxides to the federal stockpile. Monazite concentrate from the Lowman mill is sold directly to metallurgical processors.

In developing treatment methods to extract the valuable constituents from the Bear Valley black sands, a considerable amount of original research was required. This applied both to the separation and concentrations problems involved in milling and also to the subsequent chemical treatment at the Mallinckrodt plant to separate the various oxide components of the mineral euxenite.

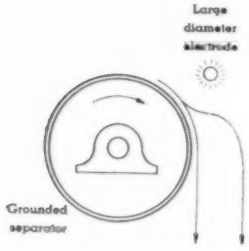
Magnetic Susceptibility

The principles involved in electromagnetic separation are fairly well understood and there is little need to dwell on them here. An ideal arrangement of the minerals in the Bear Valley black sands in the order of decreasing magnetic susceptibility would read something like this: magnetite, ilmenite, garnet, columbite, euxenite, monazite and spinel, and zircon.

Several factors combine to affect the measured magnetic susceptibility of the various minerals, and among these are: the influence of impurities in the mineral grain; the size of the mineral grain and the difficulty in making precise measurements of small particles; and the intensity of the field in which the measurements are made. Suffice it to say that there is an extremely narrow range of magnetic susceptibility existing between ilmenite and euxenite as given in the above order of susceptibility. Practical considerations, such as specific gravity, mineral surface alteration,

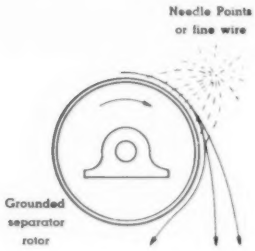
Principles of High Tension Separation

THE LIFTING EFFECT
(Electrostatic)



1. Depends on the ability of materials to assume a surface charge.
2. Capable of separating minerals with the same relative conductivity but different affinities to surface charge.
3. Small degree of separation per pass. (Usually 10%-20%.)
4. Sensitive to temperature, humidity, etc.
5. Voltage range usually 0 to 20,000 volts.
6. Current flow per 5 ft. of separator rotor 0 to 20 microamperes.

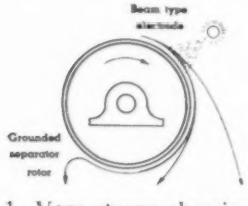
THE PINNING EFFECT
(Some current flow)



1. Charges surface of poor conductors.
2. Separates particles of different conductivity only.
3. High degree of separation. Usually 80%-95%.) High amount of recirculating load (usually 30%-50%).
4. Not very sensitive to temperature, humidity, etc.
5. Voltage range usually 0 to 30,000 volts.
6. Current flow per 5 ft. of separator rotor 15 to 1,000 microamperes.

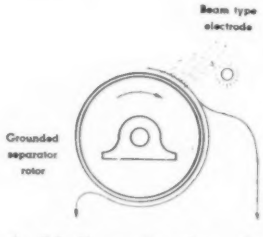
HIGH TENSION SEPARATION

Strongest pinning effect
High current flow



1. Very strong charging effect. Will even pin good conductors if not controlled.
2. Separates particles of different conductivity only.
3. High degree of separation. (Usually 85%-98%.) Moderate recirculating load. (Usually 20%-40%).
4. Not very sensitive to temperature, humidity, etc.
5. Voltage range usually 0 to 50,000 volts.
6. Current flow per 5 ft. of separator rotor 1 to 2½ milliamperes.

Combination effects



1. Medium charging effect. Pinning sustained by an electrostatic field.
2. Separates particles of different conductivity only.
3. High degree of separation. (Usually 85%-98%.) Low recirculating load, (usually 0-20%).
4. Not very sensitive to temperature, humidity, etc.
5. Voltage range usually 0 to 30,000 volts.
6. Current flow per 5 ft. of separator rotor 0.25 to 1 milliamperes.

Diagrams courtesy of Carpco Manufacturing Company

moisture content of feed, size ranges, and so forth, affect the efficiency of operation of any magnetic separation device. Magnetic separation of Bear Valley sands is generally applied as a bulk roughing operation to scalp out relatively large portions of unwanted magnetics from the sands.

High Tension Principles

The principles of high tension or high voltage with current flowing in the field is less understood. Briefly, separation of minerals, using this method, depends on the relative difference in conductivity of various minerals. J. Hall Carpenter, in a paper presented at the 1956 American Mining Congress convention, said:

This type of separation (high tension) has a fairly simple principle. The minerals are conveyed into a field where a high voltage discharge is taking place. The conveyor is usually a spinning rotor. The minerals which conduct electricity to a degree do not obtain enough surface charge to affect them appreciably, and therefore, travel off the rotor following a normal trajectory. Minerals which are non-conductive, however, take on a strong surface charge and are usually pinned by this charge to the rotor. They follow the rotor around until brushed off. If sufficient current discharge is allowed to pass between the electrode and the rotor, and the rotor speed is slow enough to allow the materials to be charged to the fullest, then nearly all materials can be pinned to the conveying rotor. As the rotor speed is increased or the discharge to the rotor lessens, then materials which are conductive, and therefore discharged to the rotor, are thrown off the rotor first. Whether the material is considered, a conductor which is thrown off the rotor, or non-conductor which is pinned to the rotor, is a relative matter. In general, however, for practical separations, the pinned or non-conductor materials include all the silicates, phosphates, calcites, etc. The materials which are thrown off the rotor and are classed with conductors include all the metallics and many of the oxides and sulphides.

Separation of the Bear Valley black sands has been found to be most effective when the feed has been reduced to minus-12-mesh. The relative conductance of minerals arranged in increasing order are: silicates, phosphates, carbonates, oxides, and sulphides.

Development of the flowsheet was under the overall direction of the Galigher Company. But several other or-

ganizations were instrumental in ore testing from which data were compiled for the flowsheet. These included Stearns Magnetic, Inc., Carpco Engineering & Manufacturing Co., and Dings Magnetic Separator Company. A great deal of process data and operational details were developed in a pilot plant and laboratory of Porter Bros. Corporation.

Wet Plant

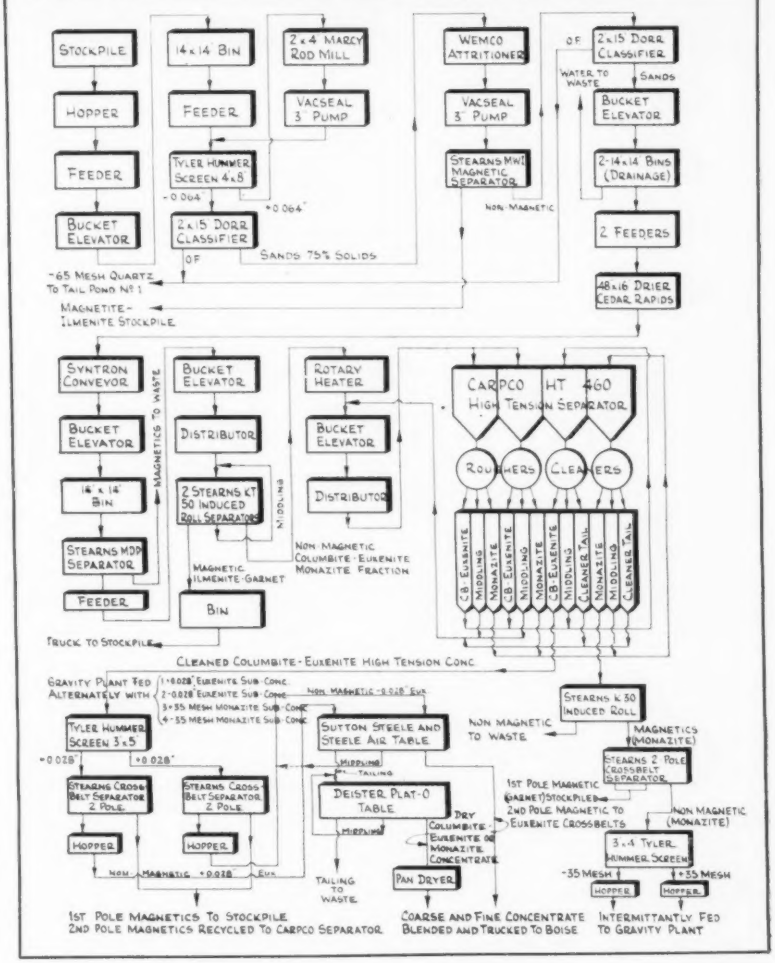
The dredge concentrates, trucked 20 miles from Bear Valley to Lowman, are dumped on a stockpile area level with a concrete-lined crude ore bunker at the mill. They are bulldozed into the bunker as necessary to provide mill feed. A small Hough loader, operating on a concrete apron forming the floor of the bunker, picks up the black sand and introduces it to a hopper. The sands are belt conveyed from the hopper to a bucket elevator and discharged to a 14- by 14-foot steel bin, serving the wet circuit of the mill. The dredge concentrate is fed to a Tyler 4- by 8-foot Hummer screen with 0.064-inch openings and which is in closed circuit with a Marcey 2- by 4-foot rod mill. The screen undersize is washed in a 2- by 15-foot Dorr classifier. The classifier overflow, which is primarily 65-mesh quartz, is wasted.

The classifier sands are discharged at approximately 75 percent solids to a Wemco attritioner. This unit essentially consists of the three Fagergren rotors and stators. Agitation in this unit serves to scour and improve the surface properties of the mineral particles for subsequent separation. A 3-inch Vacseal pump introduces the scoured pulp to a Stearns MWI (Crockett-type) magnetic separator where 99 percent of the magnetite and a small portion of the ilmenite is pulled from the pulp. This high iron reject is piped to a separate tailing pond where it is stockpiled pending study for possible development of a market. The non-magnetic portion of the pulp treated in the above separator is again washed in a second Dorr 2- by 15-foot, mechanical-rake classifier. The overflow is discharged to the mill tailing pond. The classifier sands are transported to a bucket elevator and transferred to either of two 14- by 14-foot steel bins.

Drying

The feed to these bins has a moisture content of 12 to 15 percent. Primary purpose of the bins in addition to providing surge capacity for the dry circuit, is to allow an approximate 8-hour drainage period for the pulp. Water drains through the discharge opening at the bottom of these bins

Flowsheet Porter Bros. Corporation Plant For Concentrating Columbite-Euxenite and Monazite. Capacity is 150 to 200 TPD.



reducing the moisture content to approximately 8 percent. This, of course, reduces the capacity requirements of the subsequent drying step.

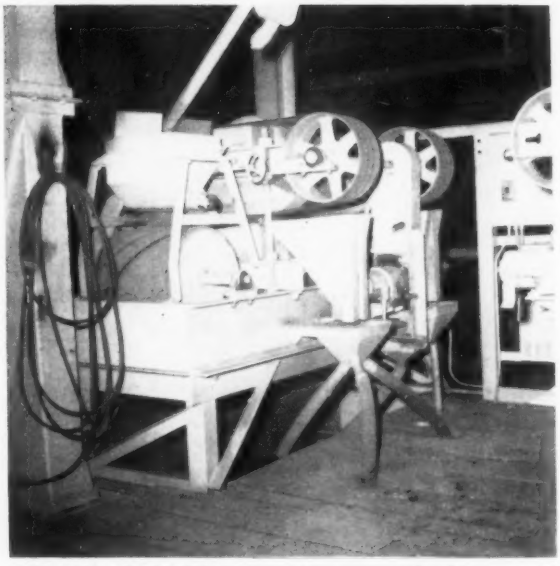
Drying is carried out in a Cedar Rapids 48-inch-diameter by 16-foot-long (hot-mix type) rotary kiln fired with a high-grade Diesel number 2 oil. This oil is used in preference to a low-grade oil to prevent deposition of carbon on mineral surfaces. The presence of carbon on the minerals, of course, would affect magnetic and seriously hinder high-tension separation properties. In the winter, stove oil is mixed with the number 2 Diesel fuel to prevent freezing. The discharge from the drier is taken by a Syntron conveyor to a bucket elevator which deposits the feed in a 14- by 14-foot surge bin serving the dry circuit.

Dry Circuit

In the dry circuit, black sand drawn from the bin is first delivered to a Stearns MDP (drum-type) electromagnetic separator to pull off a magnetite-ilmenite middling product missed at the separator in the wet circuit. Following this preliminary dry-scalping stage, the feed is conveyed by a bucket elevator to a distributor serving two Stearns twin, KT 50, induced-roll machines. A twin, induced-roll separator consists of eight horizontal rolls arranged in two vertical rows of four rolls each. Feed to each of the four rows of the two twin units is evenly distributed.

The primary object of the induced rolls is to pull ilmenite and garnet from the black sands. Practical considerations require that this function be carried out at a high rate, producing an ilmenite product as low in columbite, euxenite, and monazite as possible. Separation of the ilmenite-garnet fraction from the "radioactive blacks" could be more efficiently carried out by using electromagnetic crossbelts. But the treatment capacity

BY-PRODUCTS recovered at mill are stockpiled pending potential market development. Large bin contains ilmenite and small bin receives quartz rejected from mill.



STEARNS CROSS-BELT separators clean columbite-euxenite and monazite fractions following high tension separation. Above unit pulls ilmenite and garnet from feed.

of the crossbelts is so limited that possibly 50 or 60 would have been required to scalp out garnet and ilmenite. On the other hand, the induced rolls offer high capacity while yielding a lower grade columbite-euxenite-monazite product. The low capacity, but efficient crossbelts are reserved for cleaning the "radioactive blacks" later in the circuit.

Product Flow

In the induced roll separator, each vertical row of four rolls consists of a rougher roll, a cleaner roll, and two scavenging rows in series. The non-magnetic portion from the first roll drops to the second roll which is the cleaner. The non-magnetic portion from the second or cleaner roll is the finished first step, bulk, columbite, euxenite-monazite concentrate. The magnetic portion of the rougher roll drops to the third roll which is the first scavenger, and the magnetic portion from the third roll reports to the fourth roll, the second scavenger. The fourth roll magnetic product is the finished ilmenite-garnet tailing. The magnetic fraction of the second roll, the cleaner, and the non-magnetic fractions of the two scavenger rolls join to form a circulating product which is returned to the feed end of the induced rolls. Reference to the accompanying schematic diagram illustrates the flow of feed and products through the circuit. The ilmenite garnet reject from this separation is trucked to a stockpile pending possible use development of this product.

The bulk columbite-euxenite-monazite concentrate reports to an oil-fired rotary heater 3 feet by 8 feet long. This unit heats the radioactive blacks to 350° C. Hot mineral surfaces serve to aid subsequent high-tension separation of monazite from the columbite-euxenite.

High Tension Separation

Separation of columbite-euxenite fraction from the monazite fraction is carried out in a Carpco HT 460 high tension separator. This unit consists of one row of four horizontal rotors equally spaced and parallel to each other. Rotors measure 6 inches in diameter by 60 inches long. Parallel to each rotor, and extending for the entire rotor length, is a beam type electrode.

Essentially a beam electrode consists of a large diameter DC electrode which has a non-discharging field and a fine wire (0.010-inch in diameter) which tends to discharge readily. The wire is supported between two posts attached to each end of the electrode, and is in electrical contact with the electrode. The combination of the electrode and the wire creates a very strong discharge pattern which is focused to a narrow arc and beamed at the rotor. The first two rotors in the Carpco HT 460 unit are roughers. "Radioactive blacks" are fed to the rotor from a hopper containing a slot discharge. In this manner the feed is distributed evenly along the entire length of the revolving rotor.

As the sands enter the charged field, non-conductors assume a charge and are pinned to the rotor as previously explained. Conductors assume very little charge because the current readily leaks to the grounded rotor. Therefore, the conductors normally fall off the grounded rotor as soon as it has turned sufficiently to allow the force of gravity to influence the mineral grains. The various products are split by weir-like partitions. Columbite and euxenite, being more conductive than monazite, will readily drop off the rotor. Monazite, on the other hand, is pinned until brushed off.

Adjustments

The two roughing rotors make three separations—a columbite-euxenite concentrate for further treatment, a middling product, and a monazite product. The rougher columbite-euxenite concentrate goes to the fourth rotor in the Carpco machine for cleaning. Similarly the rougher monazite product from the roughers goes to the third rotor for cleaning. The middling from each roll (both roughers and cleaners) returns to the feed end of the respective rotor.

An A-C electrode, termed an A-C wiper, is used for cleaning the pinned nonconductors from tthe roll. Adjustments for variable operating conditions include:

1. Speed of rotor
2. Gap of D-C electrode
3. Voltage input to the D-C electrode
4. Position of the lip feeding the rotor.

Crossbelt Cleaning

From this point on, treatment of the high-tension, cleaner concentrates—columbite-euxenite and monazite—varies slightly and each is described in separate sections. The final colum-

bite-euxenite fraction from the HT 460 cleaner rotor reports to a Tyler Hummer screen which makes a separation at 0.028 inches (about 20 mesh). Both size fractions of the columbite-euxenite product are treated separately in two Stearns, two-pole, magnetic, crossbelt separators. Since this is essentially a precise cleaning operation, it is important that feed to these machines be sized because magnetic susceptibility of the remaining garnet and ilmenite overlaps that of columbite and euxenite. Adjustment of the flux permits a much sharper separation on a sized product. Sizing is also important in a following gravity circuit about which more will be said later.

The crossbelts are set to pull ilmenite and garnet away from the columbite-euxenite sands. The first pole product is essentially a high iron-ilmenite (actually magnetite intergrown with ilmenite). This is stored in bins and later trucked to a stockpile because a market might possibly be developed for this product. The columbite-euxenite concentrate, clearing the two cross-belt machines, is stored separately in hoppers for treatment in a gravity plant.

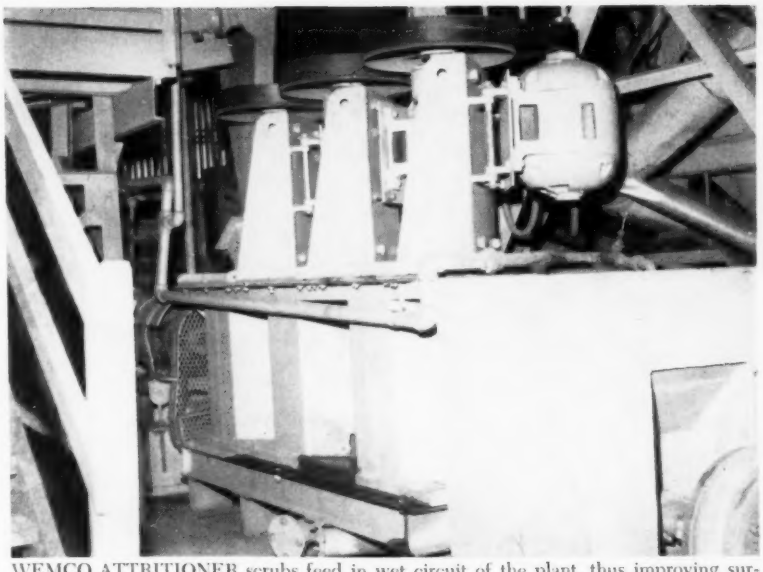
Monazite Treatment

The cleaned monazite fraction recovered from the Carpco cleaner is fed to a set of Stearns K 30 induced rolls (four rolls) which are set to reject quartz and a very minor amount of zircon. The rolls are set for maximum amperage and minimum gap for highest flux density. The magnetic fraction monazite from the first roll is cleaned twice. The non-magnetic fraction is scavenged once to make the reject.

The magnetic monazite is cleaned on a 2-pole crossbelt separator. The first pole magnetics, containing mainly garnet and ilmenite, are stockpiled. The second pole magnetics flow to the euxenite crossbelt. The cleaned monazite is screened at 35 mesh on a Tyler Hum-R screen, both fractions are separately stored for further treatment in the gravity plant.

Gravity Circuit

The two columbite-euxenite concentrate fractions and the two monazite concentrate fractions are treated separately in the gravity circuit, which is fed intermittently with each product. First, the product is introduced to a Sutton, Steele and Steele air table which makes an air table concentrate, A middling which is recycled to the table feed and a tailing which is processed on a Diester Plat-O wet table. The Diester wet table makes a wet table concentrate, a middling which is recycled to the wet table feed and a tailing which is wasted.



WEMCO ATTRITIONER scrubs feed in wet circuit of the plant, thus improving surface properties of minerals for subsequent separation by electro-magnetic and high tension means. Mill treats 150 to 200 tons of black sand feed daily.

The air table and wet table concentrates are further up-graded on a Stearns four-pole crossbelt. The following table shows the various products separated using different feed materials.

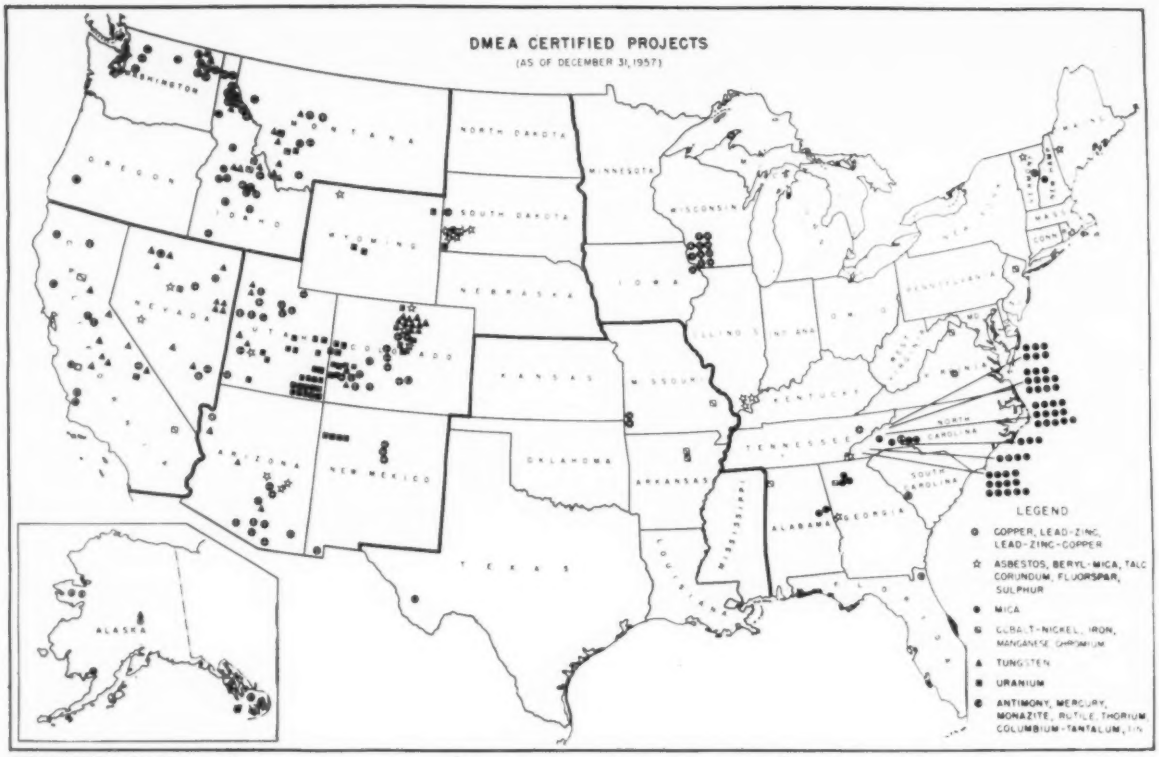
No. 3 pole is set to pull an acceptable euxenite concentrate. The No. 2 pole products are re-run at slightly different settings to produce high-grade columbite and shipping grade euxenite. The No. 4 pole monazite-euxenite products are re-run with the monazite concentrate. The non-magnetic fractions are re-run at different settings to extract contained mineral values.

Because the sought after products are radioactive, a scaler-counter is used for mill control work. As a further aid, a binocular-type microscope, 20-power magnification, is kept at the mill office. The euxenite grains are readily identified by a simple hyro-fluoric acid drop test. The acid turns euxenite green.

The Lowman mill, though small, is of great strategic importance to the United States. At the present rate of operation there is a 30-year ore reserve ahead of Porter Bros. Corporation. When one considers that during World War II, columbite was flown to the United States from Africa by plane, it is reassuring to witness development of this resource. THE END

Up-Grading Crossbelt

Feed Material	*No. 1 Pole*	*No. 2 Pole*	*No. 3 Pole*	*No. 4 Pole*	*Non Magnetics*
Wet Table Euxenite Concentrates	Ilmenite Garnet	Euxenite Columbite	Euxenite	Monazite Euxenite	Monazite Sphene Spinel Siderite Rutile Xenotime
—35 Air Table Euxenite Concentrates	Ilmenite Garnet	Ilmenite Euxenite	Euxenite	Monazite Euxenite	Siderite Monazite Spinel Hornblend Sphene
—35 Air Table Euxenite Concentrates	Ilmenite Garnet	Ilmenite Columbite Euxenite	Euxenite	Monazite Euxenite	Siderite Monazite Spinel Hornblend Sphene
All-Monazite Concentrates	—	Euxenite	Euxenite	Monazite	Monazite Euxenite



CERTIFIED DMEA exploration projects give a clear picture of the wide spread and varied mineralization in the United States. Discoveries have been made in 30 states and Alaska. Continuation of DMEA is warranted by successes to date.

Why Congress Must Pass Long-Range Legislation To Make DMEA Permanent

Recently the Defense Minerals Exploration Administration passed two milestones which should be indicative of maturity for an agency created during a world crisis and continued because of apprehension over the supply of strategic minerals. In November 1957 DMEA observed a birthday by completing six years of operation without a major overhaul, and, in February of this year, it executed its 1,100 contract for exploration assistance. It may also be significant that the majority of the original personnel in Washington, D.C., and in the Regional Offices who started with the DMEA are still with it. MINING WORLD could not let these events pass unnoticed by our readers, many of whom have contracted with DMEA for financial help in exploring their own properties.

This is not a completely happy time, however, since DMEA may not live to enjoy another birthday. Unless the Congress enacts legislation necessary to change the exploration assistance objective from defense needs exclusively to long-range requirements for new sources of minerals, the DMEA type of assistance may cease to exist. The present program, based solely on defense needs which arose during the Korean crisis, has continued to this date under the Defense Production Act even though there is now an ample stockpile of many of the strategic minerals.

Nearly everyone in the mining industry agrees with the President's Cabinet Committee on Minerals Policy, which recommended that "the program of financial assistance to private industry for exploration such as that now administered by the DMEA be strengthened and continued." This recommendation was heeded by the Department of the Interior when it included exploration assistance in the Long Range Minerals Bill proposed to Congress in 1957.

This situation prompted MINING WORLD to undertake its own exploration project to discover the real values of federal assistance in this particular field. Since 1951 we have done some random research which produced several articles for these pages about DMEA and some of its exploration projects. Now we propose to review the DMEA program to date, espe-

DMEA CASE HISTORY

Read in the June issue of MINING WORLD how the American Zinc Company of Tennessee completed one of the largest and most successful DMEA programs.

Charles R. L. Oder, chief geologist, reports how more than 35,000,000 tons of zinc ore were discovered. Of equal but long range importance was the geological information gained by drill hole exploration.

cially its organization, how it works, its policies, problems, and accomplishments.

MINING WORLD also thought the time opportune to publish some DMEA case histories which would illustrate how good geologic mapping and interpretative geology had contributed to significant ore discoveries, thereby demonstrating that properly directed exploration is warranted and opportunity for ore discovery still exists. Such a series of articles will start with our next issue.

When MINING WORLD's plans were made known to DMEA, it was hoped that the DMEA staff would take the initiative in writing these articles after selection from the many case histories of the agency. Although the plan was wholeheartedly received by the DMEA Administrator, he explained that such direct participation by DMEA would be contrary to established policy which has prohibited the release of detailed information relating to individual participants in the program.

No one should quarrel with that policy of scrupulously avoiding disclosure of confidential docket material. This is but one of the unique features of the program that has helped to cultivate and hold the confidence and support of the mining industry.

MINING WORLD acknowledges the help of DMEA in suggesting the means by which the plan could be carried out in direct cooperation with individual operators. It also wishes to express appreciation for the reference material and statistical information used in the preparation of this article.

Evolution of Exploration Plan

The DMEA was conceived during the Korean War after the dissolution of the Defense Minerals Administration, which was established in 1950 under the Defense Production Act. Under section 303 of that act the President was authorized to encourage exploration, development, and mining of critical and strategic metals and minerals. First attention was centered on developing and mining known deposits. Production incentives included direct procurement contracts, floor price contracts, guaranteed bank loans, direct loans through the Reconstruction Finance Corporation, government purchase depots, and accelerated tax amortization. These devices expanded production effectively, but they did not provide sufficient incentive to search for new domestic sources of many minerals for which the Nation was largely dependent upon foreign countries.

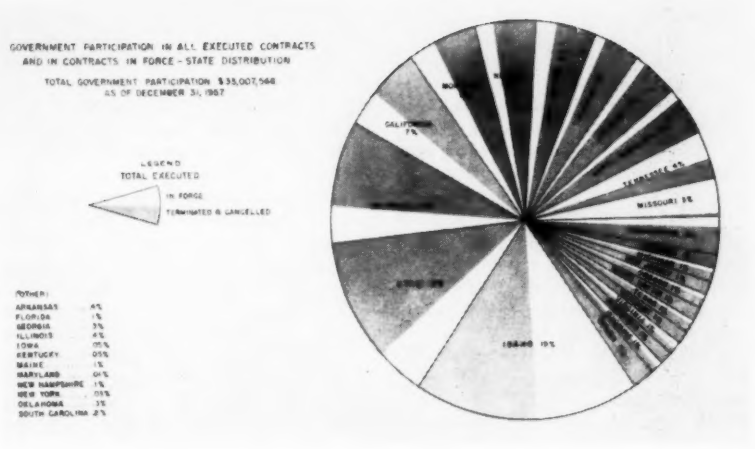
To provide adequate incentives, DMA proposed direct government financial participation in exploration costs. Its proposal to the Defense Production Administration (predecessor of the Office of Defense Mobilization) was supported by these facts:

(1) All of the easily distinguished outcrops had been investigated during recent decades.

(2) New deposits were increasingly difficult to find.

(3) Metal prices had not covered the increasing costs of exploration, and huge exploration deficits had accumulated throughout the domestic mining industry.

DMA further proposed that, as a general principle, government funds should be matched by private capital in order to limit applications to projects of reasonable merit in which the applicant himself was willing to risk his time and capital. It believed this arrangement would minimize waste of funds and foster sounder partnership relationships from a business point of view. It left the way open, however, for the government to depart from the matching principle in whole or in part in the case of highly critical materials.

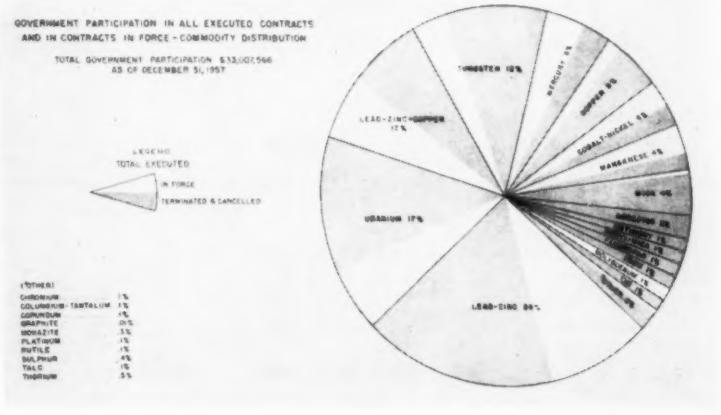


Several factors were considered in fixing the percentages of government participation. They included the criticality of each of the strategic minerals, the likelihood of that particular industry to survive in a normal peacetime market, and the difficulty or ease of making a significant discovery.

From these basic criteria a total of 32 strategic minerals were selected and set up into three categories, i.e., either 90, 75, or 50 percent government participation. Changes have been made from time to time, both as to minerals eligible for assistance and the rate at which the government would contribute toward exploration costs. These changes are shown in the accompanying tabulation.

How DMEA was established

Insofar as carrying out its other responsibilities under the Defense Production Act, DMA was essentially a recommending agency. As it was encountering interagency differences and public criticism, all functions delegated to DMA were transferred to the Defense Materials Procurement



Agency, which was created during the latter part of August. The DMPA Administrator promptly delegated the exploration program back to the Secretary of the Interior, who in November set up the DMEA as it stands today. By the end of December 1951 over 1,100 applications had been received and nearly 200 contracts executed. This was a good start for a small agency operating in a new field; especially good since new procedures had to be developed and instructions written while handling the flood of inquiries and applications.

The transition period was a tense one indeed. The exploration program was not free of criticism by any means. Charges were made that the application forms were too complex, requiring a college graduate to fill them out. The exploration contract itself was considered difficult of administration because it always required detailed cost accounting and documentary evidence of expenditures. Many small operators didn't know how to keep books, and they were always in trouble. Parts of the contract were susceptible to different interpretations on the part of government and industry, and even within the government itself. Many unforeseen administrative problems developed which the field men could not resolve because of inadequate instructions. Processing time was excessive, as was the time necessary for the government to reimburse the operator for its share of the costs. As one fellow put it, "You're an old man before you get a contract and starved to death waiting for the money."

Of course, there were also those who considered DMEA as just another "give-away" program; many large firms thought it another "boondoggle" and viewed it with considerable skepticism. So in November 1951 DMEA had its problems to solve. Its future was by no means certain, depending entirely on its ability to improve operations and win the confidence of the mining industry.

DMEA Field Organization By Regions and Areas With Executive Officers and Addresses For Each Region

Region	*Area Served*	*Executive Officer*	*Mailing Address*
I	Idaho, Montana, Oregon, Washington, and Alaska	A. E. Weissenborn	DMEA, South 157 Howard Street Spokane 4, Washington
	Branch Office, Alaska J. A. Herdlick in charge		DMEA, c/o U.S. Bureau of Mines P.O. Box 2688 Juneau, Alaska
II	California and Nevada	Spangler Ricker	DMEA, 1605 Evans Avenue Reno, Nevada
	Branch Office Roscoe M. Smith in charge		DMEA, c/o U.S. Geological Survey 4 Homewood Place Menlo Park, California
III	Arizona, Colorado, Nebraska, New Mexico, North Dakota, South Dakota, Utah, and Wyoming	William H. King	DMEA, 224 New Customhouse Bldg. Denver 2, Colorado
	Branch Offices Walter R. Storms in charge		DMEA, c/o U.S. Bureau of Mines University of Arizona Tucson, Arizona
	Stephen R. Wilson in charge		DMEA, c/o U.S. Bureau of Mines 1600 East First South Street Salt Lake City, Utah
IV	Arkansas, Kansas, Louisiana, Mississippi, Missouri, Oklahoma, and Texas	Clinton C. Knox	DMEA, Room 303, Post Office Bldg. P.O. Box 431 Joplin, Missouri
V	Alabama, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, West Virginia, and Wisconsin	Robert A. Laurence	DMEA, Room 13 Post Office Bldg. Knoxville 2, Tennessee
	Branch Office W. T. Millar in charge		DMEA, c/o U.S. Bureau of Mines College Park, Maryland

Organization

The DMEA is a separate agency of the Department of the Interior functioning under the supervision of the Assistant Secretary for Mineral Resources, as do the U. S. Bureau of Mines and United States Geological Survey. Unlike the Survey and Bureau, which obtain funds by annual Congressional appropriation, the DMEA obtains its funds by borrowing from the Treasury under authority of the Defense Production Act. Instead of appearing before the House and Senate Appropriations Committees, it justifies financial needs before the Borrowing Authority Review Board of the Office of Defense Mobilization. ODM determines percentages of participation and the minerals eligible. If the Board approves the annual estimates (which it always has done in the past), a certificate is issued which establishes a borrowing authority ceiling within which DMEA is expected to carry out its operations.

Actual funds are then made available through the execution of promissory notes, by the Secretary of the Interior, which bear interest at the then prevailing Treasury rate and mature 10 years from date. In order to keep interest charges at a minimum, the Secretary executes notes from time to time for such sums as are needed to defray the government's commitments under approved exploration contracts and to cover administrative costs.

At the outset of the program it was decided to utilize the services of geologists and engineers from the Survey and Bureau, as well as their clerical counterparts and equipment, not only to decrease costs and keep recruitment of new staff at a minimum but also to profit from the vast fund of natural resource information in the hands of these two old-line agencies.

With the exception of four auditors stationed in the field, all DMEA employees are headquartered in Washington. The organization consists of the Administrator's office, four com-

DMEA Results . . . They're Good

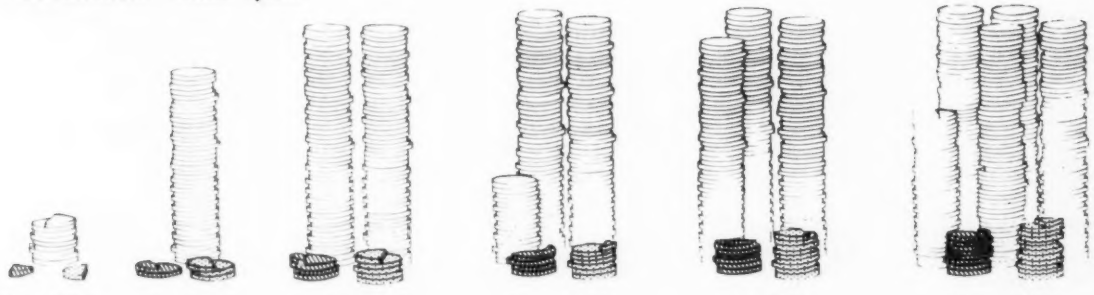
DMEA CONTRACTS, COSTS, AND ORE VALUES

1 Chip = $2,000,000

Value of potential ore

Contract Government participation

Government funds spent



Dec. 1952 **Dec. 1953** **Dec. 1954** **Dec. 1955** **Dec. 1956** **Dec. 1957**

The direct and more obvious achievements of DMEA exploration projects are the discoveries. Nearly one-third of the applications received by DMEA have been approved and become contracts, and nearly one-third of the contracts have resulted in certified discoveries or developments. At the end of 1957 there were 316 certified projects with **recoverable** value of estimated potential ore valued at approximately $465,000,000, using December market prices.

The following 21 minerals on the eligible list were found on these certified discoveries:

Antimony	Fluorspar	Rutile
Asbestos	Iron	Sulphur
Beryl	Lead	Thorium
Chromium	Manganese	Tin
Cobalt	Mercury	Tungsten
Columbium-Tantalum	Mica	Uranium
Copper	Monazite	Zinc

Eleven other minerals were found on these same projects:

Andalusite	Ilmenite	Talc
Asbestos (fibre)	Mica (scrap)	Vanadium
Feldspar	Silver	Zircon
Gold	Spodumene	

The geographical dispersion and concentration and the target minerals involved in the 316 DMEA certified projects are shown on map. The degree of DMEA success is dramatically shown by above chart which relates ore potential values to expenditure of government funds. The strong rising trend of ore values here depicted is the more impressive in light of the fact that ratios shown each year were computed using market prices prevailing at that time. For example, substantial discoveries in 1957 have more than offset the sharp drop in prices of some metals which occurred during that year.

One of the unique features of the DMEA program is the repayment provision (applicable only in the event of production and sale of material). Although the operators are under no obligation to produce, incidental production in the course of exploration work and commercial mining on certified projects (up to December 31, 1957) yielded royalty repayments to the government of more than $2,172,000, representing sales by the operator of about $43,500,000. In 29 cases the sums advanced by the government have been repaid in full.

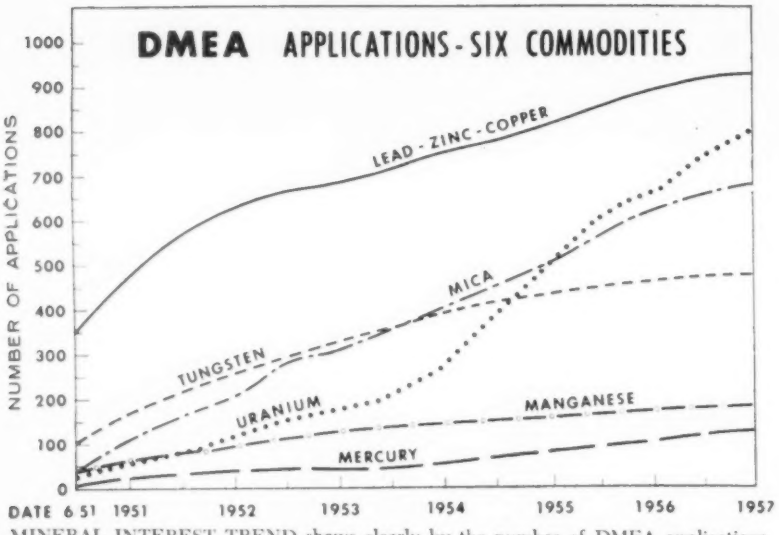
This resume of DMEA discoveries covers only a part of the total exploration picture. Circular charts show the distribution by commodity and by state, of the sums of government money committed to exploration contracts. These charts reflect the extent of DMEA effort to stimulate private exploration.

One of the less obvious products of DMEA exploration is the wealth of information on the geology and mineralogy of the properties covered by the application and contract records. All of this information, including that on the unsuccessful applications and projects, may be of great value in time of emergencies. The government is not the only beneficiary on these unsuccessful applications. Most applicants have received the benefits of detailed examinations of their properties by competent geologists and mining engineers which they might not have had otherwise. Denial of the application probably saved the applicant a considerable sum which he might have lost on ill-advised exploration.

Small business represented by individuals, partnerships, and corporate enterprises, and many of the major operators have taken an active part in the program.

Based upon financial standing, annual production, numbers of employees, and prominence in their particular field in the mining industry, in excess of 80 percent of the participants in the program are classed as small business.

About 60 percent of all DMEA contracts call for total expenditures of $25,000 or less to complete the authorized work. Approximately 40 percent of all the contracts executed provide for the operator to spend less than $3,000 of his own funds, or furnish an equivalent amount in the value of his own labor, supervision, or equipment to complete the contract.



MINERAL INTEREST TREND shows clearly by the number of DMEA applications filed. Base metal applications reached a peak during Korean War; leveled off by mid-1956. Tungsten began leveling off in 1955 following cessation of government's purchase program; no applications received since November 1957. Mica applications have remained relatively steady. By the end of 1957 both manganese and mercury were showing signs of leveling off. Interest in uranium shot upwards during 1953 following discovery and publicity of major Plateau ore bodies. The rate continued upwards following later discoveries in famed Ambrosia Lake, New Mexico. Uranium application rate has leveled off with AEC's limitation's on purchases and reduction in DMEA participation from 75 to 50 percent. The recent announcement of new mill capacity applies to ore discovered prior to 1 November 1957.

modity divisions, a Contract Administration and Audit Division, and an Operations Control and Statistics Division. Legal services are performed by the Solicitor's office of the Department.

Field work is performed on a regional basis under direction of a field team consisting of one member each of the Geological Survey and the Bureau of Mines, one of which is designated as Executive Officer by the Administrator. The other member serves as his alternate. Each field team is responsible for handling all DMEA work within its given region and is assigned such staffs from Survey and Bureau personnel as may be necessary. Under this arrangement the United States is divided into five regions as shown in box.

Processing Procedure

Applications may be filed directly with Washington, D.C., but it is preferable to file with the nearest DMEA Field Office to permit an immediate review by the Field Team for completeness, supporting documents, etc., after which they are forwarded to Washington.

Careful analysis follows by DMEA engineers, commodity experts of the Survey and Bureau and, when legal questions are involved, lawyers in the Associate Solicitor's office. Applications obviously without merit or which are not eligible for aid under the regulations are immediately denied from Washington. Incomplete applications are referred back to the applicant for additional information. Those that seem worthy of further consideration are then referred back to the Field Team for an on-site examination by a geologist and an engineer who document their findings and recommendations for Field Team consideration.

The Field Team report and recommendations then undergo a critical review by the Washington personnel who either concur in the findings or bring up specific points of the proposed project which require further study. If government participation is justified, an exploration contract is prepared by DMEA and returned to the Field Team for submission to the applicant for execution.

All the processing work which flows between DMEA and the Field Teams is channeled through the Operating Committee, comprised of one representative each for the DMEA Administrator and the Directors of the Bureau and Survey. The Committee was established at the outset of the program as being necessary for the administration of the tripartite type of organization. The memorandum of understanding among the three agencies establishes the DMEA representative as chairman and also stipulates that the Committee will in no way preempt the decision-making powers of the Administrator.

The Committee serves many useful purposes. It serves as the focal point for coordinating the activities of the regional offices and transmitting instructions to the Field Teams. The members, acting as a review board, individually examine the work of their own agencies for quality and professional standards and collectively maintain uniformity of operations with respect to established policies.

Regular meetings are held in the afternoon three times weekly to consider actions listed on an agenda prepared during the morning. All business coming before them is in final form to permit mailing the same afternoon. Detailed minutes are prepared covering each meeting (which are for government use only) to keep all DMEA personnel in Washington and the field, as well as the Secretary's office, apprised of day-by-day actions.

Criteria and Guidelines

Under the regulations "exploration" is search for new or undeveloped sources of strategic minerals in a specified area or parcel of ground. It may be conducted from the surface or underground using recognized and sound procedures, including standard geophysical and geochemical methods, to obtain pertinent geological and mineralogical data in those areas where favorable targets appear to exist. The work shall not go beyond a reasonable delineation and sampling of the deposit and shall not include work prosecuted primarily for mining or preparation for mining.

Each application must fully describe the exploration project and justify it by detailed substantiating data such as maps, reports, work schedules, and cost estimates.

In passing on applications the following criteria are applied:

1. The principal mineral to be explored must be on the list of commodities eligible for assistance.

2. The proposed project must have the geologic probability of making a significant discovery and present a definite target objective.

3. The work must be designed to reasonably delineate the anticipated deposit.

4. The type, amount, and cost of the work must be commensurate with the size of the potential target.

From the foregoing it is readily apparent that funds are not available for grubstaking and prospecting or for purely reconnaissance activities performed solely for the gathering of regional geologic information which may lead to virgin or unprospected mineral areas.

The guidelines of the program may be briefly summarized as follows:

1. The proposed project site is examined by government geologists and engineers to determine whether it offers a reasonable prospect of making a worthwhile discovery. Applicants are given advance notice of the time of examination and are expected to be present so that all aspects of the proposed work, or possible alternative programs may be discussed on the ground.

2. If the project is approved, a contract is prepared which provides (a) a description of the land and of the work to be done, (b) the allowable costs for each item of work and the government's contribution thereto, (c) repayment of the government's contribution by means of a percentage royalty on production resulting from the exploration, and (d) a contractual unrecorded lien on the operator's interest in the property to secure the government's right to royalty.

3. The work is done by the applicant, not by the government.

4. The government periodically inspects the work done to assure that it complies with the terms of the contract. Field engineers check progress and costs and authorize payment of the government's share as claimed by the operator in his monthly voucher and progress report.

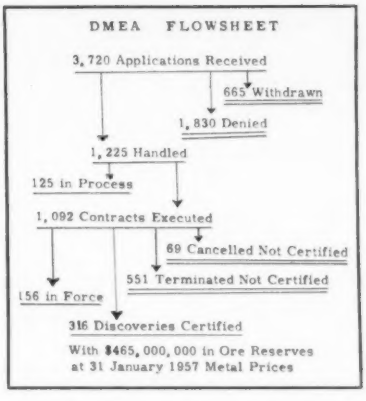
5. The final results of the work are evaluated by government geologists and engineers. If it is considered that production may result from the work within the period specified in the contract (usually 10 years from date), the government may so certify to the operator. Thereafter all production is subject to royalty until the total amount contributed by the government, without interest, is repaid or the 10-year period has elapsed, whichever occurs first. Certified projects are examined semiannually to check on production and operating status. Regardless of any certification, all production sold during the life of the contract is subject to royalty.

In the case of the larger number of projects which are terminated without certification, the operators of those projects are informed that their accounts have been closed and the Government retains no claim or lien against the property.

Operational Problems

DMEA has the responsibility of carrying out a program of considerable magnitude with many complexities resulting from the large number of metals and minerals involved. These occur in a wide range of geologic environments and present a variety of peculiar operational characteristics.

It is probably safe to say that no exploration program of comparable scope has been undertaken heretofore in cooperation with private industry.



About 130 man-years of geologists', mining engineers', and clerical help are spent each year in field operations alone.

Currently 200 applications are considered to be a normal and healthy workload, although this figure has been considerably larger in prior years.

As a rule from 75 to 100 on-site examinations are constantly scheduled. Added to these is an average of 200 approved projects in force which are visited regularly to inspect progress and results in order to potect the government's financial interest.

Very early in the program the 12-page application form NSRB-146 and its four-page supplement were replaced by a single-page form with instructions listed on both sides.

Early in 1952, after a few months' experience with the first contract forms, a new short-form contract was developed which authorized work on an agreed unit cost basis. It practically eliminated all cost accounting by the operator and helped to shorten the time required for government reimbursement. A new method of making allowances for the use of the operator's acquired equipment as an increment of the unit costs went a long way toward taking DMEA out of the "machinery business," which was already creating administrative headaches.

It is impossible to chart in advance, in every precise detail, a complete

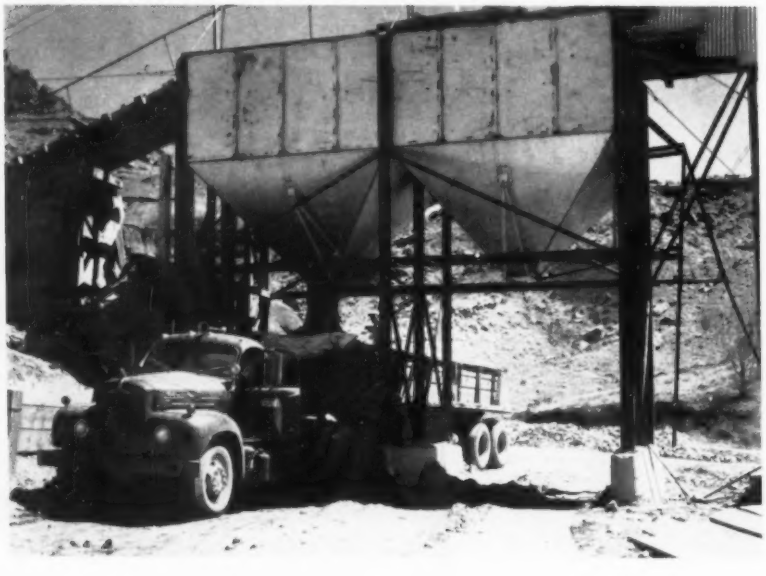
Continued on page 55

Strategic Minerals Selected for DMEA Assistance and The Percentage of Government Assistance for Each Mineral

Mineral	*MO 5 4/6/51*	*MO 5 Amended 7/17/51*	*DMEA Order 1 3/7/52*	*Amend. 2 Order 1 5/15/53*	*Amend. 3 Order 1 11/3/53*	*Order 1 Amended 3/23/54*	*Amend. 3 Order 1 Amended 5/29/56*	*Order 1 Revised 10/23/57*
Antimony	75	75	75	D	D	75	75	75
Asbestos								
(Spinning grade or strategic chrysotile)	90	90	90	90	75	75	75	50
Amosite		90	90	90	D	D	D	D
Crocidolite				90	D	D	D	D
Bauxite		50	50	D	D	50	50	50
Refractory grade only				50	D	D	D	D
Beryl	90	90	90	90	75	75	75	75
Chromium	50	50	50	50	50	50	50	50
Cobalt	90	90	90	90	75	75	75	75
Columbium	90	90	90	90	75	75	75	50
Copper	50	50	50	50	50	50	50	50
Corundum	90	90	90	D	D	75	75	50
Cryolite	90	90	90	D	D	D	D	D
Diamonds								
(Industrial)	90	90	90	90	D	75	75	50
Fluorspar	50	50	50	D	D	50	50	50
Graphite								
(Crucible Flake)	50	50	50	D	D	50	50	50
Halloysite								
(Catalytic Grade)		50	50	D	D	D	D	D
Iron ore	50	50	50	D	D	D	D	D
Kyanite								
(Strategic)	90	90	90	D	D	75	75	50
Lead	50	50	50	D	D	50	50	50
Manganese	75	75	75	75	75	75	75	75
Mercury	75	75	75	D	D	75	75	50
Mica (Strategic)	90	90	90	D	D	75	75	75
Muscovite block & film				90	75	D	D	D
Molybdenum	50	50	50	50	50	50	50	50
Monazite	90	90	90	D	D	75	75	50
Nickel	90	90	90	90	75	75	75	75
Platinum								
group metals	90	90	90	90	75	75	75	50
Quartz crystals								
(Piezo-electric)	90	90	90	D	D	75	75	50
Rare earth ores	90	90	90	D	D	75	75	50
Rutile-Brookite			75	D	D	75	75	75
Selenium							75	75
Sulphur	50	50	50	D	D	D	D	D
Talc block (Steatite)	90	90	90	D	D	75	75	75
Thorium				90	D	75	75	50
Tin	90	90	90	D	D	75	75	50
Tungsten	75	75	75	75	75	75	75	50
Uranium	90	90	90	90	75	75	75	50
Zinc and cadmium	50	50	50	D	D	50	50	50

*D. Dropped from program.

ELECTRIC POWERED Caterpillar No. 933 Traxcavator loads uranium ore. Electric motor installed in place of Diesel.



MEXICAN HAT is destination of this Mack Diesel truck with its load of ore for Texas-Zinc's new mill.

Electric Powered Caterpillar Loads

Isolated operations with company-produced power and modified mucking machinery is paying off in efficient uranium production for Radium King Mines, Inc., located in the Four Corners area of Utah.

Now that the national uranium supply situation has stabilized somewhat from the original wild boom, efficiency of operation plays a large part in the success of any venture. Operators are constantly searching for efficient, economical ways of mining ore.

Radium King, located in the Red Canyon district about 70 miles from Blanding, Utah, is one of those operators who, by fitting methods to situations, was able to become a profitable operation. When the original incline sunk to develop the mine proved less productive than anticipated, a new one was sunk in a more advantageous location; when the original method of scraper mucking proved inflexible as the crews reached deeper levels, the company replaced it with a Traxcavator to load haulage units. Ingenuity plays a part, too. Even though the mine is 70 miles from the nearest power lines, it is entirely electric powered.

Extensive core drilling in the area led to the discovery of the uranium ore body in the Shinarump conglomerate on March 12, 1956. Varying from 3 to 16 feet in thickness, the lens-shaped ore body is found in the lower part of the conglomerate. The ore contains about 0.35 percent uranium and 1.0 percent copper and is a

DRILL SITE roads are bulldozed with this D4 tractor. Radium King drills ahead of mining for better planning.

DUMPING INTO SKIP POCKET at bottom of incline. New haulage units bottom dump to speed unloading.

Radium King's Uranium Ore in Utah

typical occurrence of uranium-copper.

Sink With Front End Loader

The first 60 feet of the new 30° incline was excavated by a Caterpillar D6 tractor-bulldozer and the remaining 130 feet finished by a Cat D2 tractor with a front-end loader.

Ore is mined by the room and pillar method and, although the company is still driving exploratory drifts, a cross cut is turned about every 50 feet. At present, the deposit is developed to a maximum distance of 3,000 feet from the foot of the incline.

Blast holes are drilled by air-powered jack legs using ⅞-inch drill steel from 6 to 8 feet long and Liddicote Throwaway bits. Air for drilling is supplied by a Cat D13000-powered Worthington "600" compressor, located at the portal. Hole pattern is two rows of vertical, parallel holes, three to five holes per row, loaded with Gold Medal powder. Black Monarch fuse fires the blast, with shooting restricted to the period between shifts.

Electric Powered Traxcavator

After the blast has loosened a round of ore, a Caterpillar No. 933 Traxcavator is used to load the broken ore into haulage units. Somewhat unusual in operation, the Traxcavator is electric-powered. The Diesel engine has been removed and replaced by a 40-horsepower electric motor under the hood. Power for the electric motor is supplied through a trailing cable from the back of the machine to the power source. Originally, the mine used a cable-operated scraper on rails for mucking, but as the drifts were extended and more cross cuts were

STOCKPILED ORE is loaded into truck and trailer units with this No. 933 Traxcavator. A minimum emergency stockpile of 1,200 tons is maintained to insure regular shipments to the mill 75 miles away at Mexican Hat, Utah.

turned, this method proved too inflexible. Arrangements were made to have the special Traxcavator built and it was moved into the mine. Because it is not confined to a particular area as was the scraper, the Traxcavator can work in all parts of the mine.

Ore is loaded by the Traxcavator into a battery-powered Kersey tractor-car unit which holds 2.5 tons. The trackless train carries the ore 3,000 feet to the transfer point at the foot of the incline where the car is backed in above the grizzly and dumped through the rear door. Ore passes through the grizzly into a 3-ton skip on rails which is hoisted up the incline to the surface using a Skagit hoist, powered by a 20-horsepower electric motor. At the top of the incline, the car passes over two 125-ton storage bins where the ore is dumped.

From the bins, the ore is loaded into 26-ton tractor-trailer trucks for a 75-mile haul to the new Texas Zinc Mineral Company's mill at Mexican Hat.

In addition to the two storage bins, the company also maintains a 1,200-ton emergency stockpile. If ore runs low in the bins, it is supplemented by ore from the pile, where it is loaded into the trucks by a Diesel-powered Cat No. 933 Traxcavator.

Ventilation for the mine is supplied by two electric-powered No. 3 Ventaire fans, one blowing and one sucking. Air is carried down a drilled hole near the transfer point and through vent pipe to the face where the crew is working. The exhaust is sucked up through another hole on the opposite side of the grizzly area.

Communications between the underground level and the surface are maintained by an electric-powered telephone system and communications are maintained with the nearest machinery service point, Grand Junction, Colorado, by a short wave radio. For quick service or transportation, the mine has an air strip and a Cessna 180 aircraft.

Caterpillar Electric Power

Since the mine is located at least 70 miles from the nearest power lines, all electricity for the entire operation is supplied by one Caterpillar D326 (Series F) Diesel electric set, rated at 100-kw. The set supplies 110-volt current for lighting the mine, the office, the trailer camp where the 44-man crew lives, and for powering tools in the equipment shop. Hoist, fans, the Traxcavator and other heavy operations at the same time draw 440-volt power from the set. Because the crew works two eight-hour shifts, seven days a week, the electric set works full-time. As a standby, the company has a Cat D7700 electric set rated at 40-kw.

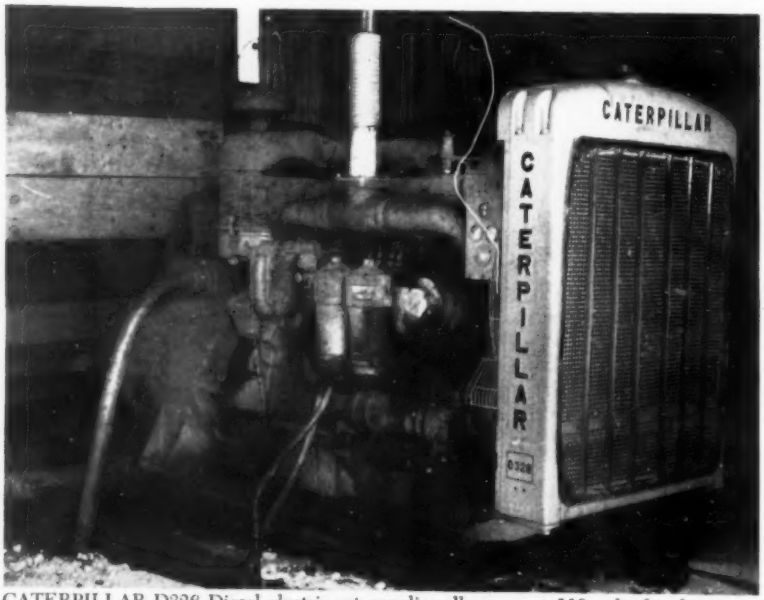
At present, Radium King produces 3,000 to 5,000 tons of uranium ore monthly.

Plans for the immediate future of the mine include the addition of another tractor haulage unit to speed production. At the same time, the transfer point will be modified to accommodate bottom-dumping cars, allowing the units to pass over the grizzly when dumping and eliminating the need for backing up as in the present arrangement.

Detailed exploration is carried on by the company in the area surrounding the mine. A crew with a mobile core drill continually explores for ore. The crew has two bulldozer units, a Cat D4 tractor and a D6, which provide motive power for the drill rig and build roads to new drill sites.

Radium King Mine is under the direct supervision of Duncan Harrison, vice-president in charge of mining. Bill Swank is the mine superintendent, A. E. Flint, chief geologist, and Edward Carnahan, geologist.

THE END



CATERPILLAR D326 Diesel electric set supplies all power at 110 volts for the camp, office, and shops as well as 440 volts to operate the underground loader, ventilation fans, hoist, and other heavy equipment.

Money Making Methods

Anaconda Uses Continuous Contact Collector For Weed Heights Gantries

The Anaconda Company at Weed Heights, Nevada recently solved the problem of maintaining uniform continuous contact between the electrified T-rails and the traveling gantry crane over the cementation launders. Anaconda operates a large open-pit copper mine and oxide leaching plant at Weed Heights.

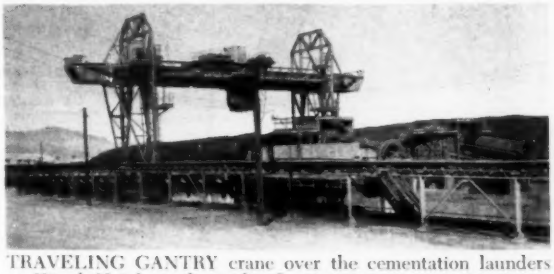
The problem which resulted in the ingenious development of the Contact Rail Collector Assembly, as shown in the picture, was the excessive swaying of the huge gantry crane causing spasmodic contact failure with the T-rails supplying the power. Due to the irregularity in such a structure preventing smooth movement, the contacts were continually meeting and leaving the T-rails.

Chief electrician M. H. Bissett designed the assembly which now provides continuous electrical contact for the gantry crane.

The purpose of the collector assembly is to provide flexibility in the contact between collector shoes and T-rails. On Anaconda's huge gantry crane when in motion, there is always excessive swinging of the structure to which the rail collectors are mounted. Formerly these mountings have always been rigid, resulting in the collector shoes becoming disengaged and sliding off the T-rails. The improved device now permits sufficient side motion, or flexibility, so that rail collectors always stay in direct contact with the T-rails.

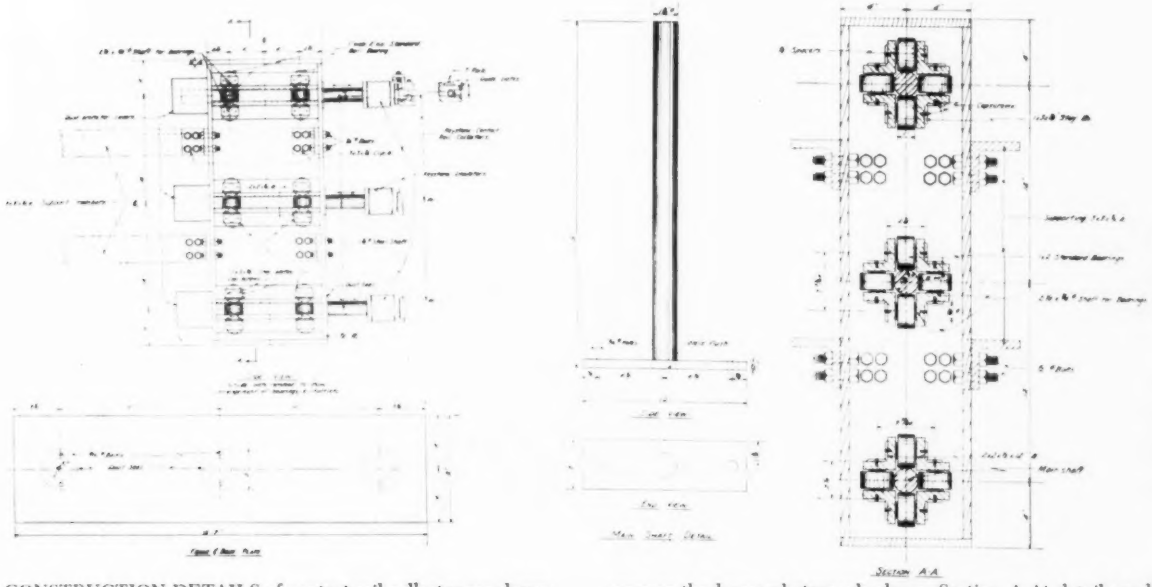
Many times small irregularities occur in the T-rails themselves and this device, by permitting side motion, also assures continuing direct contact of the rail collectors despite the irregularities in the T-rails.

The collector assembly has proven very successful on The Anaconda Company's 10-ton traveling gantry crane and the company is presently making similar installations on its loading and unloading bridges over the huge leaching tanks.

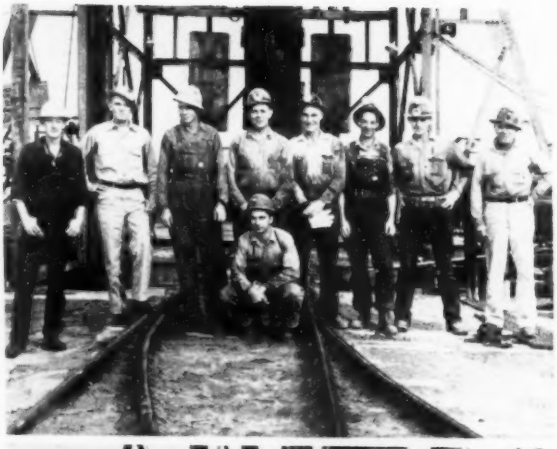


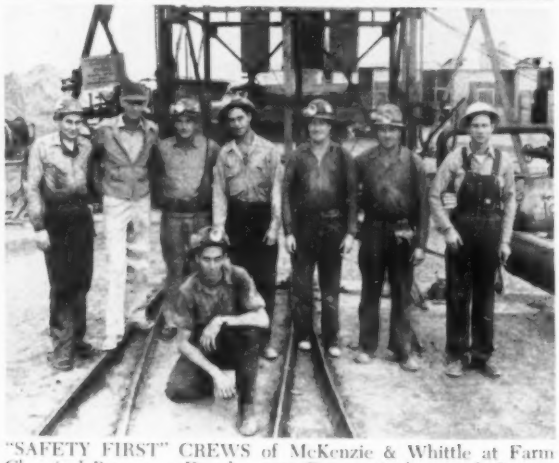
TRAVELING GANTRY crane over the cementation launders at Weed Heights where the first continuous contractor was developed.

CONTINUOUS CONTACT rail collector assembly provides uninterrupted power supply to Anaconda's traveling bridges at Weed Heights.



CONSTRUCTION DETAILS of contact rail collector are shown in these drawings. The side view (left above) is positioned the same as the lower photograph above. Section A-A' details and main shaft view are shown in drawings at right.





"SAFETY FIRST" CREWS of McKenzie & Whittle at Farm Chemical Resources Development Corporation's new shaft near Carlsbad, New Mexico. Top left: Surface crew. Top right: Bob Wilburn's crew. Lower left: Frank Buse's crew. Lower right: Dick Dicamillo's crew. SCOREBOARD posted near collar proves that shaft sinking can be safe with Safety First crews.

Shaft Sinking . . . Fast and Safe . . . At Farm Resources

By JAMES A. LILLY

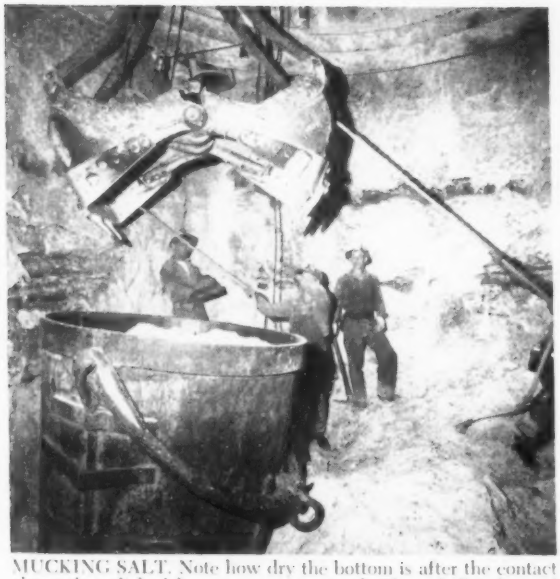
Safety first at all times and fast shaft sinking were successfully combined by the shaft crew and management when McKenzie & Whittle, Design Engineers and Constructors, sunk the 1,695-foot-deep shaft of Farm Chemical Resources Development Corporation northeast of Carlsbad, New Mexico.

Mr. Lilly is manager for Mckenzie & Whittle, Design Engineers and Constructors, Carlsbad, New Mexico.

McKenzie and Whittle used a redesigned, highly mechanized sinking system to sink, under contract, its third medium depth shaft in the potash district. See MINING WORLD, May 1956, pages 42 to 47 for a complete report on how the firm sunk the nearby National Potash Company's shaft, using a seven-cycle sinking system.

Fast Sinking Attained

During October 1957, 300 feet of 15-foot-diameter, round vertical shaft were sunk from a depth of 1,205 to 1,505 feet, completely concrete lined, and permanent steel guides and piping installed. During the six-day work week from June 3 through June 8, 90 feet of shaft were sunk and lined from a depth of 515 feet to 605 feet. This mark was reached again during the final week of sinking in October when McKenzie and Whittle completed the shaft from 1,415 to 1,505 feet. The



MUCKING SALT. Note how dry the bottom is after the contact above the salt had been pressure grouted. Clam shell is hoisted and lowered from surface in response to operator's (left) signals.

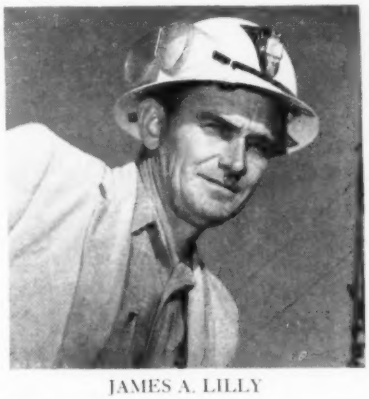
FINISHED SHAFT at 1,428 foot mark showing concrete lining details and 90 pound rail guides. The 1½ cubic yard lay-down concrete bucket on way down with load of concrete.

complete sinking log is shown in table.

Safety First Program

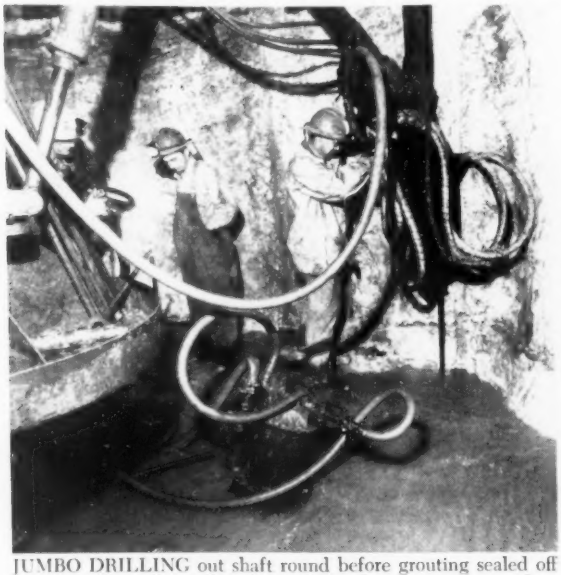
The safety program maintained at all times was a most important part of the shaft project and is of equal importance to the speed of sinking.

When sinking 300 feet in October, there was not one single accident. In completing the entire shaft, including station work and clean-up, there were no compensation cases usually used as the yard stick for lost-time accidents. However, at a depth of 935 feet one man received a back injury which required that he be placed on light duty for a while (out for six days). Otherwise, the record was perfect.

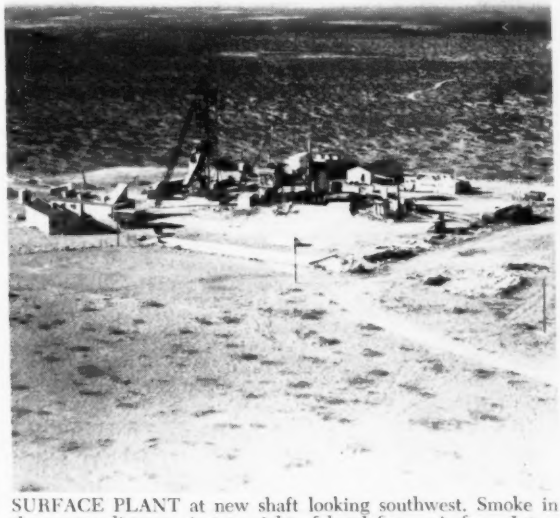


JAMES A. LILLY

The strict safety program under the direction of the contractor's engineer, R. T. Reeder, was a very tangible thing to all. In a notoriously hazardous occupation made up of truly rugged individuals, the rules and restrictions were written by the men themselves. Starting with the usual basic safety rules, at weekly "All-Hands" Safety Meetings, the "Job-Law" was expanded, modified, rewritten, and made workable by the intelligent efforts of the very experienced shaft men themselves. After 700 feet of shaft were completed, the "All Hands"



JUMBO DRILLING out shaft round before grouting sealed off water. Jumbo is hoisted to the surface when not in use to clear the shaft for mucking or concreting equipment.



SURFACE PLANT at new shaft looking southwest. Smoke in the center distance, just to right of head frame, is from International Minerals and Chemical Corporation's mine.

Sinking Log at Farm Chemical Resources Development Corporation's Shaft, Carlsbad Potash Basin, New Mexico

Period	*Footage Advance for Month*	*Total Depth End of Month in Feet*	*Formation, Remarks*
March 13, 1957 to March 31	95	95	Surface caliche & siltstone
March 31 to April 30	180	275	Siltstone & sandstone
April 30 to May 31	240	515	Siltstone & sandstone
May 31 to June 30	240	755	Siltstone & sandstone
June 30 to July 31	150	905	Culebra limestone (water)
July 31 to Aug. 31	90	995	Grouting & pressure sealing
Aug. 31 to Sept. 30	210	1,205	Anhydrite & halite
Sept. 30 to Oct. 31	300	1,505	Anhydrite & halite
Oct. 31 to Dec. 7	195	1,695	Halite (station cutting)
Dec. 7 to Jan. 29, 1958	——	——	Station & clean-up

Safety Meeting was held bi-monthly and finally monthly. However, supervisory safety meetings were still observed weekly.

The participating AFofL labor unions maintain a safety committee and their cooperation, along with the wholehearted support of the owner, resulted in an efficient safe operation. Gone is the all too frequent attrition within the work force usually attributed to shaft mishaps. Experienced men were on the job all day every day with almost no change in employees.

Only Four Men In Shaft

With all of the work below the collar performed by only three shaftmen, plus an operating engineer on the mucker, the dependence upon qualified men was parallelled by the requirement that the machinery on this highly mechanized job function properly—all the time.

The man responsible for the smooth operation of the many pieces of equipment was Earl C. Kraner, long time tunnel and shaft master mechanic for the company. It was under his vigorous thumb that shaft experienced AFofL mechanics made the job appear easy when working with the ever present distance hardship, for there are quite a few miles between machine shops in the New Mexico desert.

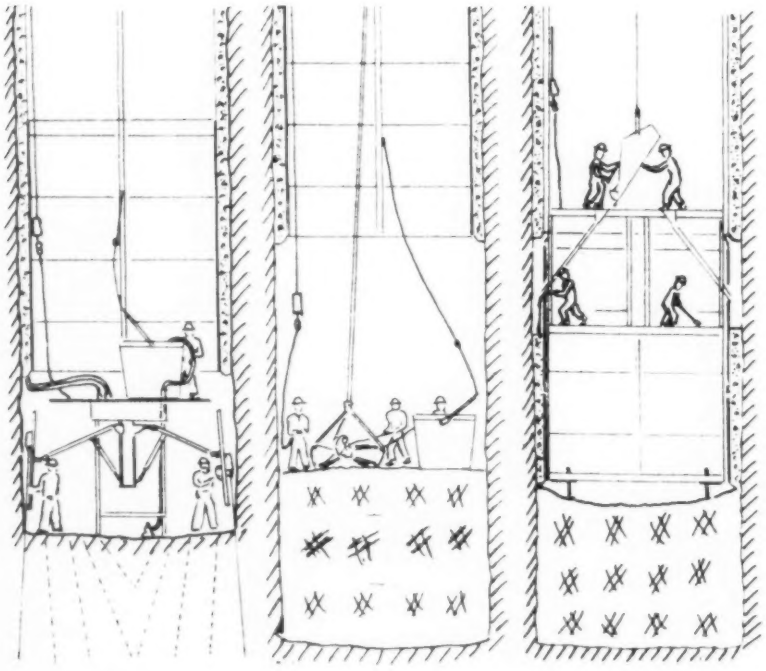
The all too often ignored job maintenance was a matter of first importance in the sinking scheme. The higher the degree of mechanization, the more dependent is the sinking rate on whether or not the equipment is "jam-up." However, in any sinking operation, faulty equipment quite often results in tragic accidents. So, to the maintenance department goes a full share of the credit for the sinking speed and safety.

Sinking supervision was headed by Leonard O. Bone, superintendent, with each shift under the direction of company foremen: Dominic Dicamillo, Robert Wilburn, and Frank Buse.

All had experience in a number of circular, concrete-lined shafts. All had a hand in implementing the company program of increased mechanization through experience in two earlier shafts.

Working with 25 to 50 percent fewer shaft men than usually considered as a normal force, fast shaft progress was greatly assisted by the fortunate circumstance that at collaring in mid-March the best shaft men in the southwest were available—all with circular concrete experience.

How 32 Men Sank 1,695 Foot Shaft



Drill, muck, concrete, then repeat is the basis of sinking cycle used at Farm Resources shaft. Actually six cycles including leveling off and setting forms are used. From left to right are:

DRILL round out using jumbo with air-motor-feed drills positioned with hydraulic actuated booms. Use V patterned round with 12-foot steel to pull 10 feet.

MUCK with clam shell into sinking bucket. The operator controls, from bottom of shaft, the movements of the clam shell by hoists mounted on the surface. Two miners position and swing clam by pulling tagline ropes.

CONCRETE is poured directly from bucket into chutes leading from center of shaft to steel forms. Concrete is vibrated into place. Forms remain as protection during next mucking and drilling cycle.

32 Men; Only 9 On Bottom

Here's the total crew—only 32 men—who sunk the shaft: superintendent, engineer, master mechanic, office manager, three foremen, nine miners, three mucker operators, three hoistmen, three top landers, three utility mechanics, one shop mechanic, one electrician, one mixer-laborer, and one laborer. Operations were carried out three shifts per day, six days per week.

Paying top rates, without lost wages due to down time, and because of the inherent job safety, the contractor was able to remain firm in his stand against incentive pay.

No matter how closely supervised, it is believed by McKenzie and Whittle that bonus or footage payments lead to "Shorting-the-Job," the end result of which is sloppy workmanship with the very definitely associated "accidents" that maim and kill. THE END

DMEA Program

Continued from page 47

exploration project from start to finish because original concepts change as work progresses. One approach to the problem is to approve conservative amounts of work and then consider additional work after a careful re-evaluation of the project. This procedure is a safe and cautious one but a great time waster for both the government and the operator.

To meet the situation, DMEA long ago adopted the multiple stage contract to authorize successive steps to be undertaken when justified by the results of the previous stage. In all cases the commencement of the subsequent stage requires prior government approval, which authority is delegated to the Field Teams. In ordinary practice, approval is frequently given informally by telephone or during periodic visits to the property—later confirmed in writing. The Field Teams may also modify the work so long as it remains within the original scope of the project, and they may terminate the work on the spot when it appears that the probability of making a significant discovery no longer exists.

The Operator's Monthly Report and Voucher and Progress Report, which under all contracts must be filed monthly in order to claim reimbursement, have been completely revised for the convenience of the operator. This change played a part in reducing the time for payment of the government's contribution to a point where it is now comparable with standard industry practices.

Numerous administrative circulars and special instructions to the field have been issued over the years which represent administrative determinations necessary and pertinent to the improvement and uniformity of operations. They cover a wide range of subjects, including Field Team responsibilities and functions; procedures for processing applications; reporting, administration of projects, consents to lien and subordination agreements; independent contracts; treatment of fixtures and improvements and operating equipment as allowable costs; disposition of property; payments and collections; terminations and rescissions; damages to land as an element of costs; repair and maintenance; treatment of access roads; operator's monthly and final reporting; semi-annual reporting on certified projects, etc. Two audit manuals have been published for government use setting for the accounting standards to be used in auditing costs of exploration work and auditing production records for purposes of royalty computation.

Applications and Disposition

Through December 31, 1957, a total of 3,720 applications proposing exploration work estimated to cost more than $200,000,000 had been received. Of these, 3,595 have been disposed of and the remainder are in process. Each application is considered in the order in which received and is judged solely on its merit, whether it be submitted by a small operator or a large company. It is admitted that those from small operators often require patient, sympathetic, and understanding review because many proposed projects have not been thought out thoroughly before submission of the application.

Almost half of all applications investigated have been denied because information available indicated a low probability of making a significant discovery. One might expect that each denial makes a potential enemy of the program, but experience does not so indicate. One of the better attributes of DMEA may be that in denying an application it is, in effect, cautioning the applicant against spending his own money on a project of dubious merit. It seems that the overwhelming majority accept a denial in that spirit.

THE END.

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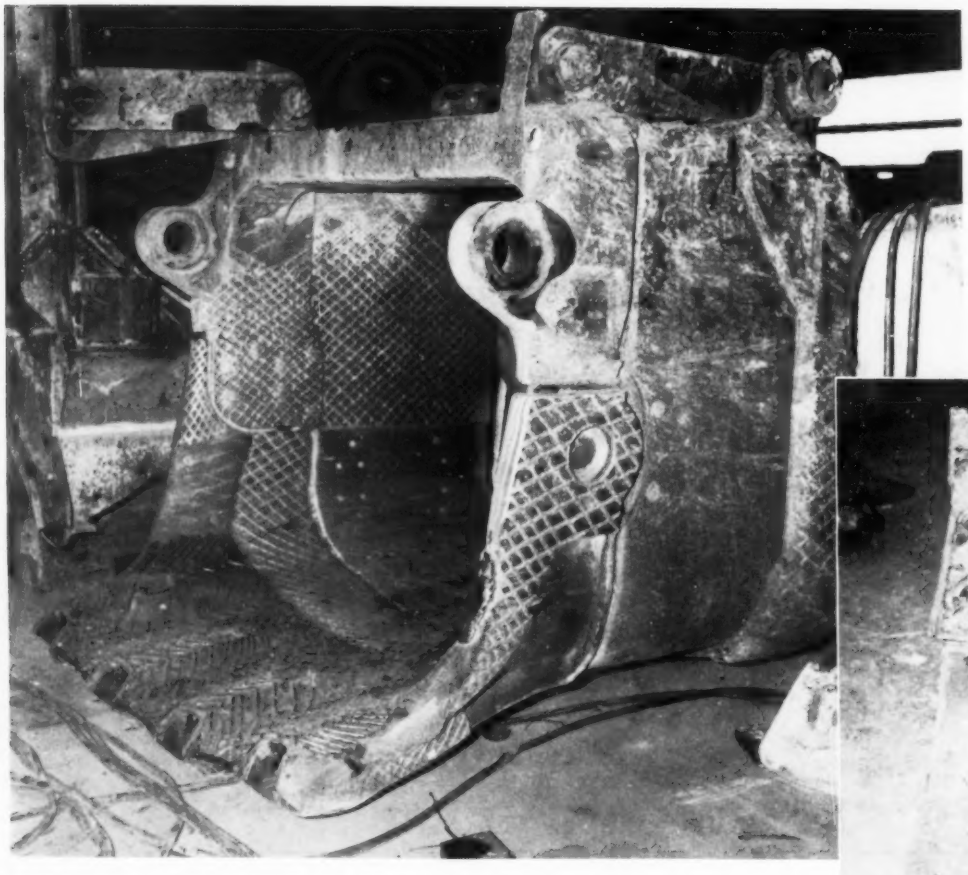

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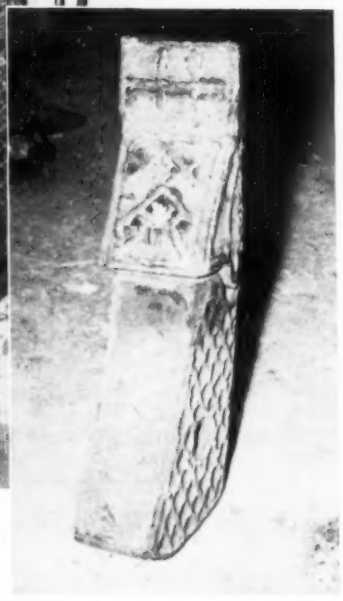

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Personalities in the News——

WALLACE G. WOOLF, vice president in charge of the Bunker Hill Company's Kellogg, Idaho operations, was chosen "Inland Empire Engineer of the Year" by the Washington Society of Professional Engineers. Mr. Woolf, who was sponsored by the Columbia Section of the American Institute of Mining, Metallurgical & Petroleum Engineers, was responsible for research work done at Bunker Hill leading to development of "four-nine" zinc (99.99 plus percent pure).

Darrell Gardner, former assistant general manager, has been promoted to general manager of Magma Copper Company at Superior, Arizona, replacing the late **C. B. Foraker. Garvin Augustadt** will assume duties as general superintendent and **Cecil Tomerlin,** former assistant mine superintendent, will replace Mr. Augustadt as mine superintendent.

Lawrence F. Black, former general superintendent of U. S. Steel's Columbia-Geneva Steel Division plant at Provo, Utah, has been promoted to the newly created position of manager of Utah operations. In his new position Mr. Black will become manager of Columbia Iron Mining Company's operations as well as Columbia-Geneva operations. **A. E. Terry** will succeed Mr. Black as general superintendent and **Carl J. Forkun,** former assistant to the general superintendent, will replace Mr. Terry as assistant general superintendent.

Farlow C. Davis has joined the staff of International Minerals & Chemical Corporation at Carlsbad, New Mexico, as metallurgical development engineer. Mr. Davis was formerly a research engineer at the Battelle Memorial Institute in Columbus, Ohio.

James C. Gray, former vice president of United States Steel Corporation's coal division, is now administrative vice president of the raw materials department at Duluth, Minnesota. Mr. Gray will be in charge of production in mining raw materials in both domestic and foreign operations.

GROVER J. DUFF, western manager for the Eagle-Picher Company, has retired after nearly 25 years of service with the company. Mr. Duff was first employed by Eagle-Picher in 1934, and served for seven years as superintendent of operations at the Montana mine in Ruby, Arizona. For the next four years he served as manager of operations at Marion, Kentucky, and was then transferred to Arizona, as Western Manager. For the past 13 years he has been responsible for the San Xavier mine and Sahuarita mill near Tucson. Mr. Duff will continue to live in Tucson.

A. L. Hayes has been elected president of the Texas-Zinc Minerals Corporation and will make his headquarters in Grand Junction, Colorado. Mr. Hayes, a former official of New Jersey Zinc Company which is a co-owner of Texas-Zinc, has served as manager of the company since 1956. **Howard S. McCray** was elected chairman of the board of directors and chief executive officer of the company.

Jack Curzon, former director of exploration and development for Climax Molybdenum Company, division of American Metal Climax, Inc., in Golden, Colorado, recently transferred to the company's New York office where he will assume new duties with the exploration department.

Dale I. Hayes is now vice president and general manager of Hidden Splendor Mining Company, Salt Lake City, Utah. Mr. Hayes was formerly employed as assistant to the president of American Zinc, Lead and Smelting Company at Knoxville, Tennessee.

Stephen E. Erickson, director of beneficiation for M. A. Hanna Company, Hibbing, Minnesota, was elected chairman of the Minnesota Section of the American Institute of Mining, Metallurgical, and Petroleum Engineers, succeeding **John D. Boentje.** Other officers elected were **Robert J. Linney,** 1st vice-chairman; **Ralph W. Mersden,** 2nd vice-chairman; **R. W. Livingston,** 3rd vice-chairman; and **Robert L. Bennett,** secretary-treasurer.

George K. Coates was recently promoted to plant manager of the National Lead Company's uranium mill at Monticello, Utah. Mr. Coates served as general superintendent of the mill for the past two years. **Brower Dillinger,** former plant manager, is now serving as assistant plant manager in charge of research, development, and engineering at National Lead's Titanium Division Mac-Intre Development in Tahawus, New York.

William A. Stringfellow has been appointed senior industrial engineer of the Florida Phosphate Minerals Department of International Minerals & Chemical Corporation at Bartow, Florida. Mr. Stringfellow joined International's staff about a year ago.

W. C. Lapple has joined the staff of United States Steel Corporation, Oliver Iron Mining Division's Research Laboratory at Duluth, Minnesota. Mr. Lapple was formerly associated with Midwest Research Institute, Kansas City, Missouri. **W. L. Zeiher** has been named assistant superintendent of the Division's Plummer mine. Mr. Zeiher was formerly employed as district supervisor of training.

Robert H. Holgers is now assistant superintendent of the Montreal mine, Montreal, Wisconsin, operated by Oglebay Norton Company. Other appointments at the mine include **John Magnuson** as operating engineer; **Lawrence Uril** as mining captain; **W. W. Viebahn** as chief electrical and mechanical engineer; and **Leo Arducant** as master mechanic.

L. T. KETT, chairman of the board of Mountain Copper Company of California and general manager of Mountain Copper Company, Ltd., was recently appointed chairman of the mining committee of the San Francisco Chamber of Commerce. The committee is devoted to the expansion of the western mining industry and the promotion of San Francisco as mining headquarters city of the West.

Roy G. Scott, mining engineer with the U. S. Bureau of Mines, was recently transferred to Washington, D. C. from Albany, New York.

L. Stevens Condor, former assistant mine engineer for the Potash Company of America, Carlsbad, New Mexico, has been promoted to staff engineer. Before joining the Potash Company, Mr. Condor served as mine engineer for several eastern Kentucky coal companies.

E. A. Schroer, mill superintendent of the Kennecott Copper Corporation's Chino Mines Division at Hurley, New Mexico, has retired. Mr. Schroer joined Chino as a mill sample foreman in 1922. He was named mill superintendent in 1948.

Alan R. Fraser is now supervisor of extractive metallurgy and mineral dressings at Armour Research Foundation of the Illinois Institute of Technology in Chicago. In his new position Mr. Fraser will direct research associated with recovery of metals from ores, concentrates, slags, or scrap. Mr. Fraser was previously employed with the Chromium Mining and Smelting, Ltd. for 18 years.

Lee A. Hammons has accepted a position as field engineer with the Department of Mineral Resources, Phoenix, Arizona. Prior to joining the Department's staff, Mr. Hammons maintained a consulting practice at Blanding, Utah.

Rudolph Bovitz has been promoted to plant maintenance foreman at U. S. Steel Corporation's Oliver Mining Division Sherman Crushing plant in the Chisholm district in Minnesota. Mr. Bovitz has been employed by Oliver since 1941.

J. FRANK HENDERSON has accepted a position with Kaiser Engineers, Oakland, California, as a development engineer in the Minerals Division. Prior to joining Kaiser's staff, Mr. Henderson was employed as mill superintendent with the Southwest Potash Corporation of Carlsbad, New Mexico. In his new position, Mr. Henderson will be responsible for development of new clients in the metallic and non-metallic minerals field throughout the United States and Canada.

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Newsmakers in International Mining

LEN HARRIS, employed by the Cerro de Pasco Corporation in La Oroya, Peru, recently began a tour of inspection of mining and metallurgical operations in Australia. Included in his tour are Mount Morgan Mines, Ltd., Electrolytic Zinc Company of Australasia, Ltd.'s facilities at Risdon, and Electrolytic Refining and Smelting of Australia Pty. Ltd. at Port Kembla. Mr. Harris began his metallurgical career at Mount Morgan and was also employed with Mount Isa Mines, Ltd. and Radium Hill, S. A. He plans to return to Oroya in two to three months.

K. E. MacKay has been appointed manager of Nchanga Consolidated Copper Mines, Ltd., Northern Rhodesia, replacing **V. A. Gladman.** Mr. MacKay's previous experience in the Rhodesian Copperbelt began in 1933, when he was first employed with the Rhokana Corporation as a shift boss and mine captain. He has also been associated with the Anglo-American Corporation as assistant manager and acting underground manager of Brakpan Mines Limited and underground manager of Daggafontein Mines, Ltd. More recently he was employed as assistant manager with the Rhokana Corporation and manager of Bancroft Mines, Ltd.

Dr. Carlos Perez de la Cova was recently appointed head of Venezuela's Ministry of Mines and Hydrocarbons, succeeding **Dr. Jose Lorenzo Prado,** who held the job for only a few weeks. Dr. Proda has returned to his work in the government's National Laboratory.

Hector Monette has been appointed manager of East Sullivan Mines, Ltd., Montreal, Canada. Mr. Monette, who was formerly employed as manager of the associated Quebec Copper Corporation, replaces the late **Herb J. LaRonde.**

Donald M. Hay, director of Naylor, Benzon & Company, Ltd., London, England recently inspected manganese mining operations of the Societe Anonyme Cherifienne d'Etudes Minieres in Casablanca, Morocco.

Don H. Baker, Jr. supervisory metallurgist at the Bureau of Mines' Electrometallurgical Experiment Station at Boulder City, Nevada, will receive one of 10 "Arthur S. Flemming" awards given each year to outstanding young men in the Federal Government. Mr. Baker was honored for developing a fused-salt electrorefining process that had made it possible to produce titanium metal in "superpure" form, and may also be applicable to zirconium, hafnium, chromium, and vanadium.

E. C. Roper, president of Howe Sound Company, recently resigned. Mr. Roper has not yet announced his future plans.

Robert R. McCabe, formerly employed with Cia. Metalurgica Mexicana in Concepcion del Oro, Mexico, has accepted a position with Cia. Minera Penoles S. A. and is now living in Avalos, Mexico.

David L. Coolbaugh is now employed as mining advisor with the Government Technical Institute in Insein, Union of Burma. Mr. Coolbaugh was formerly a consulting engineer in Golden, Colorado.

Hans Vogelstein, president of American Metal Climax, Inc., New York, and **E. J. T. Goldie,** company director, have been appointed to the board of directors of the Rhodesian Selection Trust group. Mr. Goldie, who was also appointed to the boards of Roan Antelope Copper Mines, Ltd. and Mufulira Copper Mines, Ltd., has resigned from the London advisory committees of the Rhodesian Selection Trust and Roan Antelope.

Joseph Dabby, superintendent of the Geophysics Institute of Israel, recently visited mining operations in the Gas Hills, Crooks Gap, Copper Mountain, and Shirley Basin uranium districts in Wyoming to study drilling operations. Mr. Dabby's tour was sponsored by the International Cooperation Administration.

C. W. Engelhard, chairman of Rand American Investments Pty. Ltd., will serve as chairman of Rand Mines Ltd. until the end of 1959. **W. M. Frames,** present chairman, plans to retire in May but will continue to serve as a director. Other recent appointments at Rand Mines include **G. V. R. Richdale** and **W. Marshall Clark** as joint deputy chairmen; **P. H. Anderson** and **T. Rockie** as joint managing directors, and **B. G. Twycross** as executive director.

R. D. Coursen is now director of the Malayan Tin Bureau with headquarters in Washington, D. C. Mr. Coursen succeeds **L. W. Meekins** who recently retired.

H. D. Hubbard has been elected to the board of Reef Nigel Exploration Gold Mining Company, Ltd., Union of South Africa.

H. L. Hendrie is now underground manager for Chibuluma Mines, Ltd. at Kalulushi, Northern Rhodesia. Mr. Hendrie was formerly associated with Mufulira Copper Mines, Ltd.

Dickerson R. Watkins, formerly assistant mine superintendent with San Francisco Mines of Mexico at San Francisco del Oro, Mexico, is now associated with the mine department of International Minerals & Chemical Corporation at Carlsbad, New Mexico.

E. K. Barnes, director of Sidney Mining Company, Kellogg, Idaho, has been elected vice president of the company, succeeding the late William A. Beaudry. Mr. Barnes is also president of the Northwest Mining Association. **Fred E. Marler, Jr.** was appointed to fill the vacancy on the board. Mr. Marler has been secretary-treasurer of Sidney for the past 11 years.

DON MacLEOD (right) will assume duties as metallurgical superintendent with the Rhokana Corporation in Northern Rhodesia. Mr. MacLeod succeeds E. O. A. SUNDSTROM who has retired and plans to return to Sweden. Dr. J. P. KEARNEY, former cobalt plant superintendent, will replace Mr. MacLeod as superintendent of the Nkana mine concentrator.

G. Stevens, formerly employed as mining engineer with the Department of Mines at Buhavo, Belgian Congo, was recently transferred and is now associated with the Department of Mines at Brussels, Belgium.

Bernard V. Mossington has been named smelter foreman for Kennecott Copper Corporation's new plant now under construction at Hayden, Arizona. Prior to joining Kennecott, Mr. Mossington served as a smelter foreman for Chile Copper Company at Chuquicamata, Chile.

J. J. Crowhurst has been named to succeed **R. B. Fulton** as manager for Dawn Mining Company at Ford, Washington. Mr. Crowhurst was previously employed as manager of Granduc Mines, Ltd. at Vancouver, British Columbia, Canada. Mr. Fulton has been transferred to the New York office of Newmont Mining Company.

Frank J. Wiebelt, retired U. S. Bureau of Mines mining engineer, received the Commendable Service Award and Bronze Medal of the U. S. Department of Interior. The award was made for Mr. Wiebelt's contributions to the Bureau's exploration for manganese and his efforts resulting in development of domestic manganese deposits to aid steel production during World War II.

J. Hare was recently appointed to the board of directors of Lydenburg Gold Farms, New Durban Gold and Industrials, Ltd., and New Witwatersrand Gold Exploration Company, Ltd., all in the Union of South Africa.

J. R. Bulman was recently appointed director of industrial and public relations of the Quebec Iron & Titanium Corporation, Montreal, Canada. Mr. Bulman was formerly industrial relations manager of Carbide Chemicals Company, Division of Union Carbide Canada, Ltd. and was at one time employed by Merck & Company Ltd. and the Federal Civil Service Commission in Ottawa.

Charles R. Cox, president of Kennecott Copper Corporation, has been awarded a citation from Forbes Magazine as one of "America's 50 foremost businessmen." **Irving W. Wilson,** president of the Aluminum Company of America, and **Morse G. Dial,** president of the Union Carbide Corporation, received similar citations.

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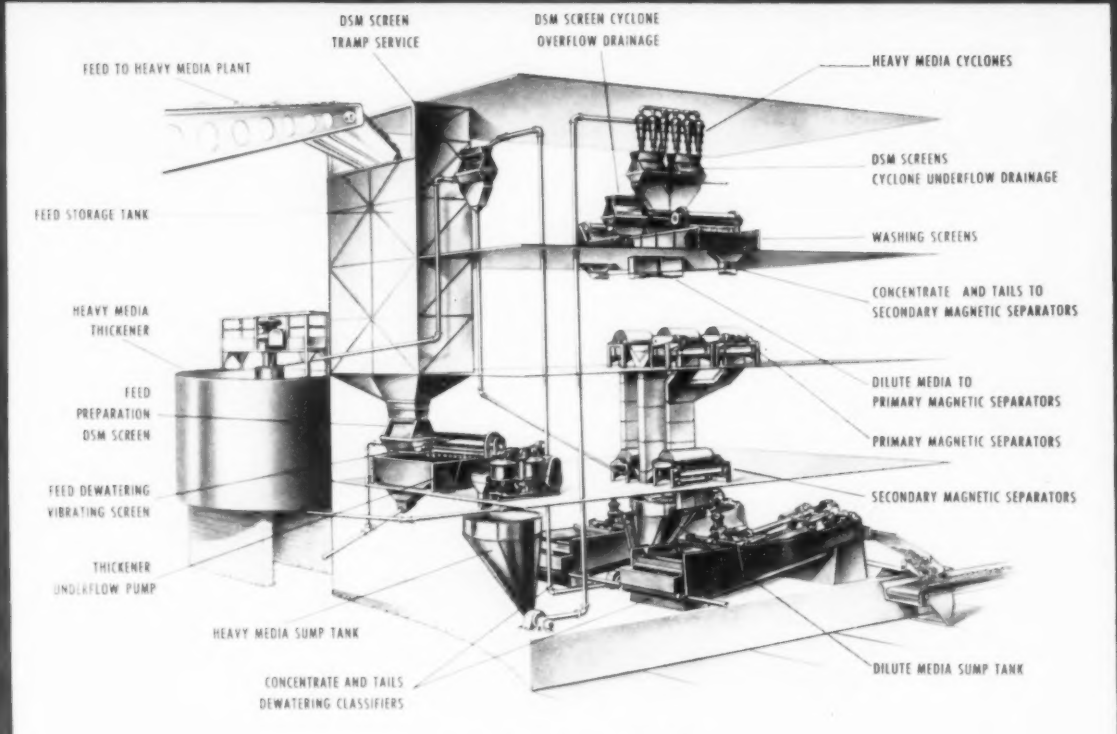
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HEAVY MEDIA THICKENER
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FEED DEWATERING VIBRATING SCREEN
SECONDARY MAGNETIC SEPARATORS
THICKENER UNDERFLOW PUMP
HEAVY MEDIA SUMP TANK
DILUTE MEDIA SUMP TANK
CONCENTRATE AND TAILS DEWATERING CLASSIFIERS

TYPICAL CYCLONE HEAVY MEDIA PLANT

One of the most significant new tools for the mining industries is the Dorr-Oliver DSM Screen. The marked superiority of the unit for high capacity wet screening of materials in the 8-100 mesh range has been proven by exhaustive development and test work and in numerous fields of commercial application.

For the cyclone heavy media plant operator, application of the Dorr-Oliver DSM Screen results in improved overall plant operation –

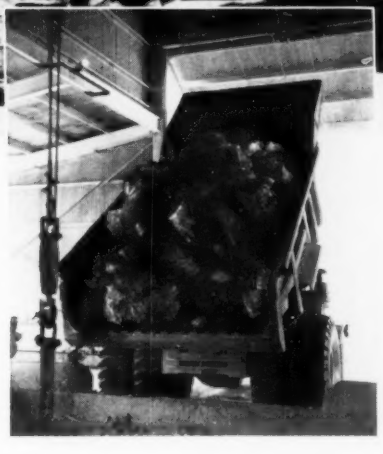
First – Applied to feed preparation, the unit eliminates fines which contaminate media and lead to higher magnetite losses.

Second – For screening of magnetite from cyclone underflow concentrate and overflow fractions, the unit reduces the amount of media sent to the cleaning circuit to a minimum, consequently considerably reducing magnetite losses.

Third – On tramp service the Dorr-Oliver DSM Screen prevents foreign oversize material from entering the heavy media storage tank.

You'll want to know more about the DSM Screen. For complete information, write for a copy of Bulletin No. 2300. Dorr-Oliver Incorporated, Stamford, Conn.

DORR-OLIVER
INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U S A



"Euclids give us good service with low maintenance and keep our hauling costs at rock bottom"

LOUISVILLE CEMENT COMPANY, SPEED, INDIANA

Six 22-ton Euclid Rear-Dumps are hauling mortar stone, Portland cement stone and overburden at the Speed, Indiana, quarry of Louisville Cement Company. Working an 8 hour shift, three of these "Eucs" handle 400 tons per hour on hauls ranging from 1000 to 3000 feet. The wide bodies with struck capacity of 15 yards are loaded by a 4½ yd. shovel in four passes. Two other units are loaded by a 2½ yd. shovel. With loaded speeds up to 30 mph, they average 80 tons per hour on a 2 mile one-way haul. In addition, three of these "Eucs" work a second shift hauling overburden.

Louisville Cement Co., like hundreds of mine and quarry operators, has found that Euclid equipment moves more tons at lowest operating and maintenance cost. Dependable Euclid performance is the result of advanced engineering, rugged construction and almost 25 years experience with off-highway haulers.

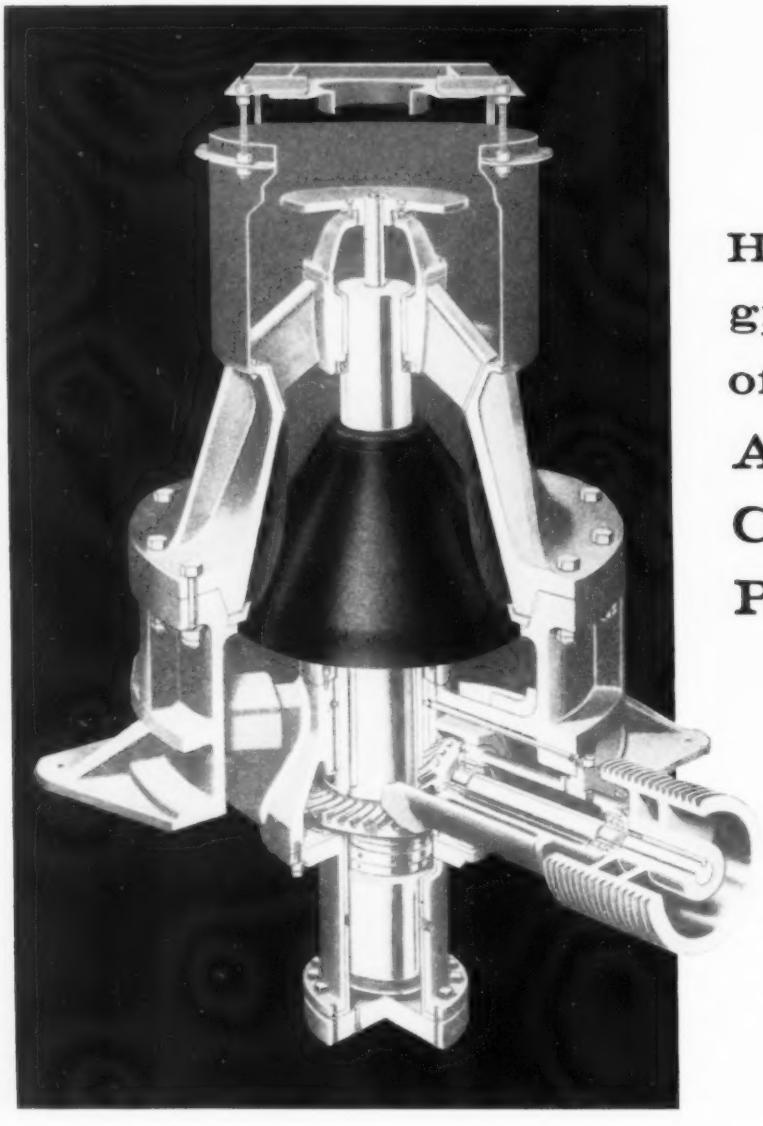
To be sure you have the most economical hauling equipment, get a production and cost estimate from your Euclid dealer on the model best suited to your work — you'll find there are a lot of reasons why ***Euclids are your best investment.***

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE



How a little give adds a lot of life to...

AMSCO CRUSHER PARTS

Concave ring and mantle of this *Hydrocone* crusher are made of the toughest steel known . . . Amsco Manganese Steel. It *gives* a little, to take more punishment. *Hydrocone* is a registered trade-mark of the Allis-Chalmers Manufacturing Company.

Both mantle and concave ring crush a lot more feed because of certain properties of Amsco® Manganese Steel. The metal *gives* a little under crushing forces, absorbs stresses, resists cracking and chipping. Yet these same forces work-harden the surface of Amsco Manganese Steel to as much as 500 Brinell . . . a high hardness, stubborn to wear.

Amsco Manganese Steel Crusher Parts maintain their ductile undersurface and work-hardened surface even when worn thin. That's why Amsco parts endure severe abuse for so many work hours without letup.

To be sure of getting Amsco Manganese Steel, order replacement parts from your crusher manufacturer. Amsco makes manganese steel parts for most manufacturers of crushing, grinding and pulverizing equipment.

Amsco also produces other alloy steels with maximum wear resistance under particular service conditions

AMERICAN Brake Shoe COMPANY

AMSCO

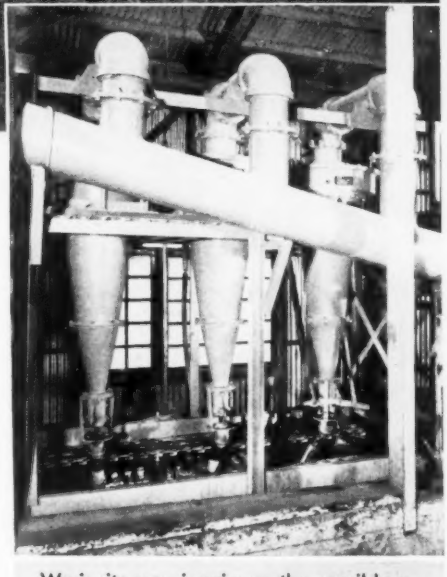
American Manganese Steel Division • Chicago Heights, Ill

OTHER PLANTS IN DENVER, LOS ANGELES, NEW CASTLE, DEL., OAKLAND, CAL., ST. LOUIS, JOLIETTE, QUEBEC

This Krebs Cyclone installation paid for itself in 3 weeks

Acoje Mining Company, Zambales, Philippines is the largest metallurgical chrome producer in the Far East. A year ago Krebs Cyclones were installed to recover values from the slime reject. From the 2,000 gpm of slimes pumped to 3 cyclones, the fine crystalline underflows contain 65 tons per day of 20% Cr_2O_3. This fine scavenged concentrate is cleaned on tables to produce 21 tpd of 50% Cr_2O_3 concentrate adding 6% to 7% to plant recovery.

Krebs Cyclones are available in 17 models for a wide range of classifications. Unique design features, many patented, include a long involuted feed entry which sharpens classification. It also permits increasing the density of the overflow or reducing feed pressure for a specific performance.



We invite your inquiry on the possible application of cyclone classification to your operation and offer the services of our pilot plant for full scale investigations.

EE PRODUCTS

EQUIPMENT ENGINEERS INC.

41 SUTTER STREET SAN FRANCISCO 4, CALIFORNIA

Manufacturers of Krebs Cyclones, Valves and Clarkson Feeders

NOW a Cone-Type Rock Bit is included in the HAWTHORNE "*Blue Demon*" LINE!

a COMPLETE LINE of bits for all soft-medium-hard formation drilling

A Cone-Type Rock Bit . . . for Oil and Minerals Exploration and Quarry Blast Hole Drilling . . . is now included in the Hawthorne "Blue Demon" *All-Formation* drill bit line.

Designed for drilling harder formations than are regularly recommended with the patented "Blue Demon" Replaceable Blade Bits, the Cone-Type Rock Bit is available from authorized Hawthorne dealers in 3⅞", 4¼", 4½", 4¾" and 5⅝" sizes.

Consistently priced, wherever you go, ask for Hawthorne Bits for all your drilling requirements.

WRITE FOR ILLUSTRATED CATALOG

HERB J. HAWTHORNE INC.

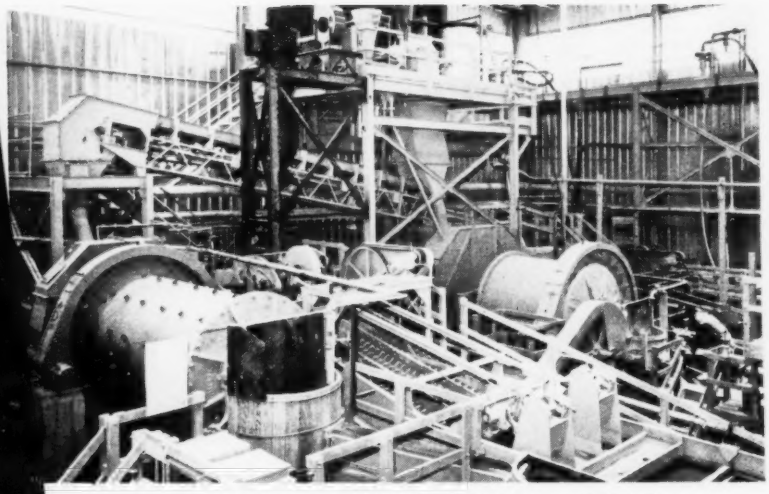
P. O. Box 7366 • Houston 8, Texas • Cable Address: HAWBIT

107

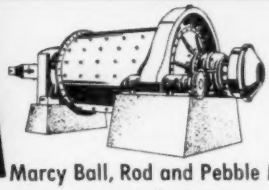
19 of the 23* Uranium Mills in the U. S.

with 85% of total U. S. Uranium concentrate capacity use

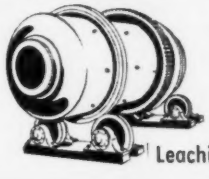
MINE & SMELTER equipment



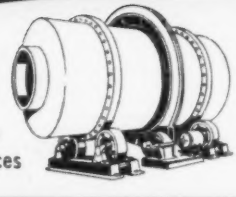
7'x 7' Acid-Proof Marcy Pebble Mill and 5'x 10' Marcy Rod Mill in Rare Metals Corporation of America's plant in Arizona.



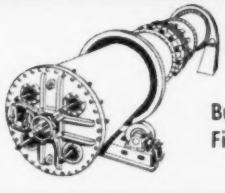
Marcy Ball, Rod and Pebble Mills



Leaching Drums

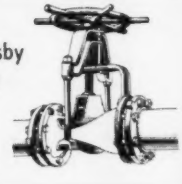


Fusion Furnaces

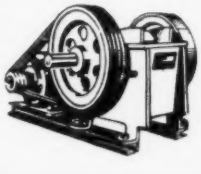


Burt Filters

Massco-Grigsby Pinch Valves

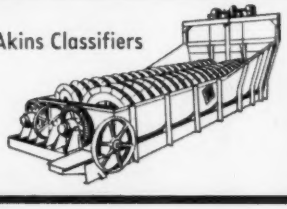


Marcy Pulp Density Scales

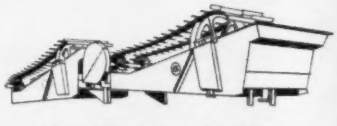


Massco Laboratory Equipment

Akins Classifiers



Skinner Roasters and Dryers



Esperanza Drag Classifiers

*Uranium mills in operation or under construction in the U. S. on September 1, 1957.

For free consultation on equipment for processing Uranium... WRITE, WIRE OR CALL

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MARCY®

PRODUCTION EQUIPMENT PREVIEW

PEP is just what new equipment, increased mechanization, and new methods can give to your mine, mill or smelter. This PEP section is MINING WORLD's way of making available to you some of the finest current information on mechanization.

Bauer Head Pulley Has Power Unit Inside Drum

The Bauer Self-Driven Head Pulley, a single unit conveyor drive with the motor and gears contained inside the head pulley drum, is now available in the U. S. from the George von Opel Corporation. Savings in space, time and power result from the compact design of the Bauer Pulley according to the manufacturer. Maintenance is minimized as there is no need for v-belt adjustments and repairs. Power for the pulleys is supplied by 3-phase induction motors available in .15 to 15 hp. For further information, circle No. 59.

Rotary Dryer Operation By Graphic Control Panel

The Graphic Control Board pictured above, for automatic operation of a new Standard-Hersey rotary dryer, was designed and manufactured by Standard Steel Corp., 5001 South Boyle Ave., Los Angeles 58, California. The control panel was developed for control of a rotary dryer in drying silica sand in an overseas operation.

The schematic diagram painted on the face of the panel is intended to simplify use of the panel in non-English speaking countries. The diagram shows the flow of material, air, fuel, and the location of driving motors and burner. All dryer operations are controlled from this panel, including the acceptance or rejection of feed. For additional information on this type of automation, write direct to the company. Use handy reader service card.

Denver Vapor-Tight Spiral Classifier

The Denver Cross-Flow Classifier is ideally suited for classification and washing at elevated temperatures because the lower bearing is located above the pulp level. This overcomes the difficulty experienced by submerged bearing classifiers when pulps have high temperatures or acids which attack the bearings and seals located below pulp level.

Fitted with a vapor-tight cover, pressure tight feed opening and overflow discharge, as well as sealed sand discharge housing, the Vapor-Tight Spiral Classifier is capable of retaining pressures to 15 pounds and greater. The unit, available in corrosive-proof construction, is manufactured in sizes from the 6-inch lab unit to the 60-inch diameter spiral unit. For additional information circle No. 58.

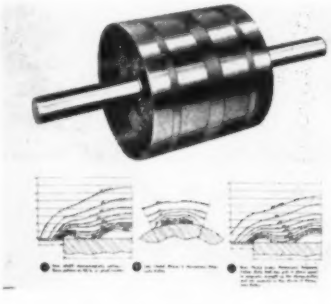
New Payloader Has More Capacity, Handles Easier

The Frank G. Hough Co., Libertyville, Illinois, has recently announced production of an entirely new "Payloader" model, the H-25. It is a rubber-tired, front-end loader with a rated carrying capacity of 2,500 pounds. A combination of numerous new design features is expected to establish new standards of production and ease of operation, according to the manufacturer.

Although this new H-25 "Payloader" has more capacity and is larger and heavier than previous models, it can be operated in and out of boxcars having six foot doors. It has a short turning radius (six feet to the outside rear hub) and power-steering as a standard feature assists both maneuverability and ease of handling. For additional information write to company at above address. Use handy reader service card.

"Aqua-Tyte" Keeps Underground Interiors Dry

A new waterproofing agent called "Aqua-Tyte," manufactured by Dakota Engineering, Inc, is now available. The material is said to stop all pressure seepage and flow of water through brickwork, concrete and stonework. The manufacturer states that the material is not a water repellant or retardant, but that it is impervious to the passage of water or moisture, including water under hydrostatic pressure. Applied on masonry walls and structures, it stops capillary action. Efflorescence, water streaks, discoloration and fungus growths are eliminated. In application the material is mixed with cement, sand and water. Circle No. 50 for additional information.



Ceramic Magnet Pulley Equals Electro Types

A major breakthrough in magnetic pulley design is announced by Stearns Magnetic Products. Indox V ceramic permanent magnets energize the new pulley, producing a powerful magnetic field that effectively removes tramp iron from fast-moving conveyor burdens. The new permanent magnet pulley is reported to equal the performance of electromagnetic types, and is superior to conventional permanent magnet models.

Secret of the Indox V pulley's performance is the radial pole design of the magnet assembly which boosts holding efficiency without the disadvantage of electrical power supply. For additional information write: Stearns Magnetic Products, 635 South 28th St., Milwaukee 46, Wisconsin.

NUCLEAR DEVELOPMENT, Engineering Construction by Kaiser Engineers is the title of a new, interesting, 13 page brochure prepared for you by Kaiser Engineers. The booklet gives complete descriptions of various installations designed and built by Kaiser Engineers, as well as the services they have available. For your copy of this informative booklet, circle No. 1.

AGITATOR CATALOG: Morse Bros. Machinery Co. have recently published a new technical bulletin describing their complete line of Agitators, Thickeners, and conditioners. Circle No. 2 for your copy.

INVESTIGATE the rugged Ropemaster Slusher Blocks, available in over a dozen popular sizes to accommodate lines from ⅜ to ½-inch, to ¾ to ⅞-inches. Write for free literature to Paul E. Keesey Co. 1125 S.E. Grand Ave., Portland 14, Oregon, or Circle No. 3.

CYLINDER CAPACITY CHART: The Ledeen Mfg. Co., 3338 North Gilman Road, El Monte, California, have available for you a chart which will help you determine the right size air cylinder for your particular need. Literature is also available on remote controlled cylinders using Ledeen valves. Write to company for copies.

ROD SELECTOR: A new shirt pocket size Ranite Select-O-Graph offers welders an easy method to quickly select the proper grade of hardsurfacing rods. The guide carries the same color coding as each of the seven color coded, job graded Ranite Rods. Here's a simple way to select the proper rod for the job on hand. For your guide write to: Rankin Manufacturing Co., 616 South Marengo, Alhambra, California.

TB-66 is the number of a new catalog recently published by the Thompson-Berg Co., Iron Mountain, Michigan. This brochure, now available to you describes the uses and applications of the "Superior" slushing scraper which are available in eight sizes ranging from 36 through 84 inches for use with slushers from 10 to 150 hp. The scraper features interlocking construction of shoe, and also arms to exclusive contour back, extra-long integral side plates and one-piece replaceable steel blades. Circle No. 4 for your copy of bulletin TB-66.

A STOREHOUSE OF IDEAS is the title of a new catalog published by Ohio Brass Co. This manual is loaded with ideas and suggestions for more efficient mine haulage. Circle No. 18 for your copy.

List information you want MINING WORLD to obtain for you on this card. WE'LL DO THE REST. No postage necessary if mailed in U. S.

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41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60

Also send further free information on the equipment advertised on pages:

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Pages .....; Product ..... Manufacturer .....

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DRILL RODS FOR CRAWLER mounted blast hole drills are described in Brunner & Lay Catalog No. 756. The 1½ inch round hollow extension steel is supplied in either 10 or 20 foot lengths, and with K or 600 threads. Rod couplings and bit adapters also are available for use in long hole drilling. Circle No. 20 for your copy of the catalog.

GROOVED END PIPE USERS will be interested in the Charles E. Manning Co. brochure describing its complete line of Alumiron Couplings and Fittings. The Alumiron malleable iron couplings are completely interchangeable with any other grooved type coupling according to the Manufacturer. For further information, circle No. 21.

FRICTION HOIST BOOKLET: An illustrated booklet on ASEA Multi-Rope Friction Hoists is available from ASEA Electric Co. The ASEA Friction-drive hoists, as described in the booklet, offer less rope wear, outstanding safety features, lower power demands and consumption, and flexibility of operation. For your copy, circle No. 22.

TOUGH AIR AND WATER HOSE: Quaker Rubber Division of H. K. Porter Co., Inc. has several brochures available describing its line of air and water hose. Quaker hose is lightweight for easy handling, and is designed for your toughest jobs in the mine. Circle No. 23 for copies of these brochures.

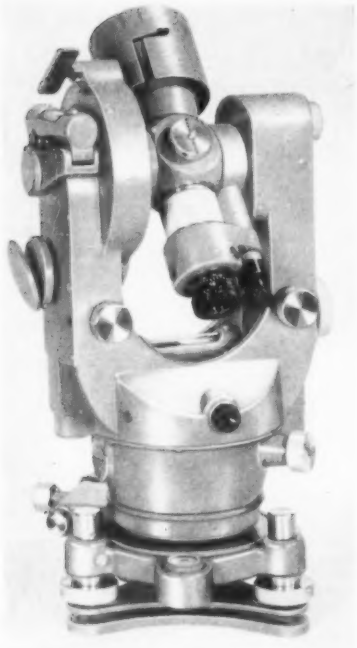
PATENTED 1-HP DRIVE delivers 150 tons of ore per hour according to engineers of the Carrier Conveyor Corp. The drive is used in conjunction with the company's Natural Frequency Conveyors. Circle No. 15 for the full story.

URANIUM DUST in sampler buildings is being reclaimed, dry, by American Air Filter Co., Inc., Amerjet fabric arresters. According to the company all dust can be caught in a dry state. For further information circle No. 16.

A NEW CATALOG, No. 581, is now available from Industrial Brownhoist Co. The brochure gives a thorough description of the new 75 ton Brownhoist Wagon Crane. For additional information circle No. 17.

PUMP SELECTOR: Just released by Nagle Pumps, Inc., 1250 Center Avenue, Chicago Heights, Illinois is Nagle Pump Selector Bulletin 158, which briefly describes the many types of Nagle Pumps, all of which are for abusive applications such as those involving corrosion, abrasion, high temperature or a combination of them. Copies sent on request.

List information you want MINING WORLD to obtain for you on this card. WE'LL DO THE REST. NO postage necessary if mailed in U. S.



Transit Set-Up Speeded by Optical Plummet

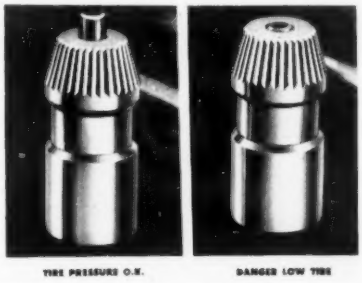
Transit men will welcome the speed and ease of setting up the Wild T-I Transit with the optical plummet. Built into the alidade, the plummet can readily be checked by rotation.

The internal optical micrometer permits both circles to be read directly to 20 seconds, with easy interpolation to 10 and 15 seconds between graduations.

A fully detailed descriptive brochure is available from Wild Heerbrugg Instruments, Inc. You will want to know more about the T-I, so circle No. 54.

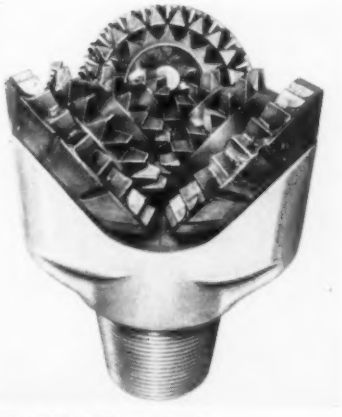
Surface Wear Solved By Hardsurfacing Protection

The importance of hardsurfacing welding regarding preventative maintenance with respect to mining equipment is explained in a new brochure recently released by Rankin Manufacturing Co., manufacturers of hardsurfacing welding materials. The brochure points out the surface wear problems and tells how Ranite helps obtain hardsurfacing protection. A new Select-O-Graph Guide makes it easy to choose the proper hardsurfacing rod for various wear conditions that may come up. Circle No. 56 for your copy.



Tire Pressure Indicator Located On Valve Stem

Designed to save costly time both on the road and in the shop, plus control the problem of truck tire wear, a new product, No-Lo Tire Pressure Indicators, are now being marketed by the Frebank Company. These inexpensive indicators, which screw on the valve stem of each tire, actually constitute miniature pressure gauges. Pre-set to desired tire pressure at the factory, drops in air pressure are indicated automatically when the red top of a pressure control rod slides back into the valve where it cannot be seen. As long as the air is at a safe level, the red rod remains visible. Circle No. 57 for more information.



CP "Air Blast" Bits Lower Drilling Costs

Air blast drilling with rotary bits, using techniques similar to those used in oil fields, is producing excellent performances and cutting blast-hole drilling costs as much as 35% over conventional percussive drilling methods. Miners employing these methods find holes up to 12-¼ inches are being drilled successfully in even the hardest formations. Penetration rates are controlled by: bit tooth-design selection; weight on the bit; variations in rotational speed and the amount of air blast required to keep the hole bottom clean and bring cuttings to surface away from cutters. The later reduces tooth and bit body wear and assures each cutter a clean, full bite. For additional information write to: Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, New York. Use reader service card for prompt reply.

Notes From The Manufacturers

CARL VON LINSOWE has been appointed chief engineer of the J. I. Case Company Crawler Tractor Works in Churubusco, Indiana. Mr. Von Linsowe, who joined the Case organization after 17 years with General Motors Corporation, replaces **T. A. HALLER** who has been transferred to Racine, Wisconsin to direct the company's newly organized Engineering Research & Development Center.

Mack Trucks, Inc. plans to build a major manufacturing plant on the West Coast, at Fremont, California. In addition to the manufacturing plant, a large parts depot, executive offices and service facilities are planned in the future. At the present time all manufacturing operations are located on the East Coast.

Robert L. Haisted has been appointed general manager of the Industrial Equipment Division of Allis-Chalmers Manufacturing Company. He succeeds **P. F. Baur** who was recently placed in charge of Allis-Chalmers International, a new operating division. **Edward H. Baxa** will replace Mr. Halsted as manager of the processing machinery department.

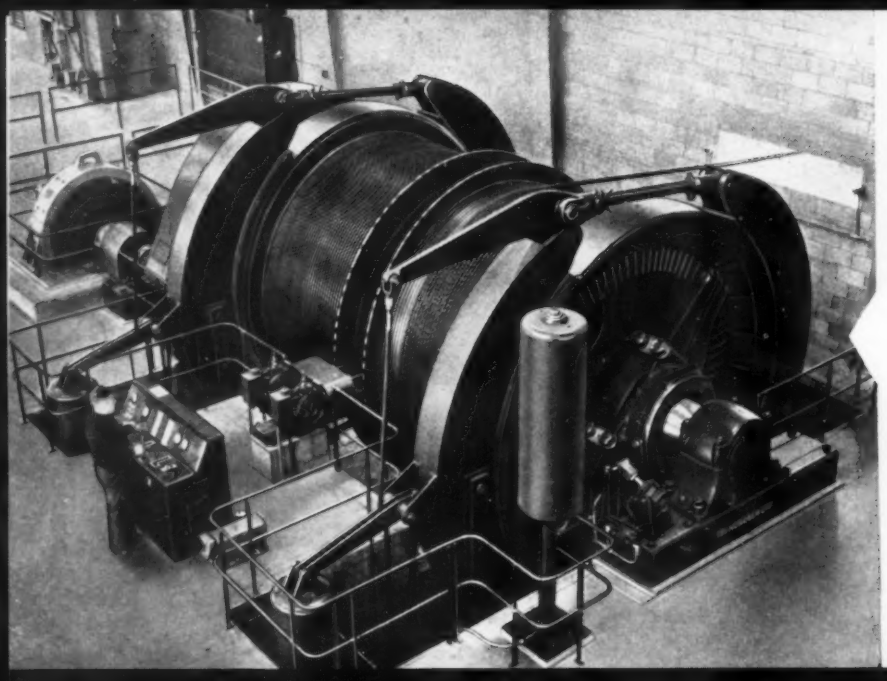
R. F. Mallina has joined the staff of the Gardner-Denver as a research consultant. Mr. Mallina recently retired from the Bell Telephone Laboratories, Inc., where he served for 28 years. In his new position, he will work with the company's Keller Tool Division, with plants at Grand Haven and Reed City, Michigan.

Wayne Burnside, former sales manager of Brunner & Lay Rock Bit of Philadelphia, Pennsylvania, is now sales manager of Brunner & Lay, Inc. in Franklin Park.

Edward R. Lawlor has been appointed product sales manager for world wide sale of Multiclone Dust Collectors, manufactured by Western Precipitation Corporation. In his new position, Mr. Lawlor will be responsible for the coordination and distribution of technical engineering and sales data, as well as working with technical personnel in the development of new Multiclone advancements.

The Chemical Division of General Mills is sponsoring a research project at the Colorado School of Mines Research Foundation, Inc., to develop superior organic extractants for the hydrometallurgical field. The first phase of the program will involve development of organic extractants for uranium, but will exentually include metals recovery by liquid extraction.

B. H. Mears, sales director of Mirrlees, Bickerton and Day Ltd. of Stockport, England left recently on a round-the-world sales trip. He will visit Iraq, Siam, Malaya, Australia, New Zealand, Canada, and the United States.



CONVENTIONAL DRUM HOISTS

Typical of the large hoisting machinery built by Nordberg is this conventional 12′ diameter by 84″ face double drum ore hoist which serves a prominent iron producer. This hoist is designed for a depth of 2800 feet, using 10-ton skips and hoisting 14 long tons of ore at a rope speed of 2000 feet per minute.

Nordberg hoists are available for manual, push-button semi-automatic, or fully automatic control.

NORDBERG'S 61 YEARS of MINE HOIST EXPERIENCE can help you select the best hoist to meet your requirements

▶ Why not let over half a century of specialized mine hoist experience help you select the *right* type and size hoist to meet your specific operational requirements?

With the trend toward larger tonnages and more powerful hoists, greater emphasis must be placed on the proven experience and ability of the hoist manufacturer. Here, Nordberg has an established reputation second to none, and can furnish both conventional and friction type hoists. This wide experience is at the call of mine executives everywhere. *Consult Nordberg on your next hoist problem.*

FRICTION TYPE HOISTS

Where applicable, the hoisting of ore, men or materials can be economically handled with Nordberg Friction Hoists . . . built for either counterweighted skip or skips-in-balance operation. Manual, push-button semi-automatic, or fully automatic control available. Outstanding features of the Nordberg design include: One-piece welded steel drum; anti-friction roller bearings throughout; pressure applied—pressure released hydraulic brakes with emergency gravity application.

Illustrated is a 4-rope hoist designed for push-button semi-automatic, multi-level operation, to handle men and material.

NORDBERG
MINE HOISTS

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MH157

ASARCO, Jack Waite Sign New 99-Year Agreement

A new 99-year lease and agreement has been signed by American Smelting & Refining Company and the Jack Waite Mining Company for operation of the Jack Waite mine, located on the Idaho-Montana border. The new agreement supersedes a previous 40-year lease which has been in effect since 1934.

According to the terms of the new agreement, Asarco has agreed to invest a minimum of $100,000 for additional exploration and development of the Jack Waite properties in the Coeur d'Alene district of Idaho and in Sanders County, Montana. Principal metals recovered from the properties are lead, silver, and zinc. After development costs have been recovered, net profits will be divided 55 percent to Asarco and 45 percent to Jack Waite, rather than 65 percent to Asarco and 35 percent to Jack Waite as in the previous agreement. The new contract is subject to the approval of Jack Waite stockholders and will be submitted to them at the next annual meeting.

Four Idaho Silver Units Merge To Cut Mine Costs

Four productive areas of the Sunshine mine in the Coeur d'Alene mining region's Silver Belt, Shoshone County, Idaho, have been consolidated for operation on a "unitized" basis to reduce both mining and exploration costs. Areas involved are the Sunshine, Rotbart, Omega and West Purim.

Sunshine Mining Company, which proposed the unitized program, had been operating the first three areas for years with the ownership of the ores as follows: Sunshine area, 100 percent Sunshine; Rotbart area, 33⅓ percent Sunshine, 33⅓ percent Polaris Mining Company, and 33⅓ percent Silver Dollar Mining Company; Omega area, 50 percent Sunshine and 50 percent Polaris.

Sunshine now holds a 57.14 percent interest in the consolidated area, Polaris 33.25 percent, and Silver Dollar 9.61 percent. Lincoln Mining Company and Hayden Hill Consolidated Mining Company, who have lease agreements with Silver Dollar, will receive royalties on production from certain sections of the unitized operation.

The participating interests were determined by the current value of each company's interest and by estimated future earning potential of the various areas.

Sunshine Mining Company, the nation's largest silver producer, in 1957 produced more than 5,200,000 ounces of silver, more than 5,400,000 pounds of lead, more than 1,900,000 pounds of copper, and more than 1,000,000 pounds of antimony.

A thorite deposit at Lemhi Pass on the Idaho-Montana border, Lemhi County, Idaho, has been purchased by *Sawyer Petroleum Company* of Los Angeles from *Ragand Minerals Company* of Dallas, Texas. Consideration was $128,000 and 600,000 shares of Sawyer stock, with a 3 percent royalty reservation. The new owner plans to produce thorium concentrates. E. W. Sawyer heads the petroleum firm. He reports that the deposit contains 750,000 tons of ore.

Clayton Silver Mines is carrying on mining operations on a one-shift basis, milling three shifts daily seven days a week, and development work on one shift per day at its property in Custer County, Idaho's Rayhorse mining district. Shaft deepening has passed the 800-foot point. About 3,000 tons of zinc concentrates have been stockpiled. An air-driven Eimco tractor with bulldozer blade is being used in the 500 North Stope to remove ore from the footwall, level tops of muck piles, and reduce manpower and powder usages. Norman M. Smith Kellogg, is general manager and W. M. Yeaman, Yakima, president.

Idaho Mining and Milling, Inc. of Lewiston, Idaho has been incorporated to acquire and operate mines and mills. Philip W. Jungert, Lewiston; Marion E. Jungert, Clarkston, Washington., and Karl R. Samson, Riggins, were incorporators. Capitalization was listed at $900,000.

A 500-foot-long shoot of silver-copper ore has been developed above the 2,800-foot level in the Silver Summit area of the Coeur d'Alene mining region's silver belt by *Polaris Mining Company*. The firm's 1957 production from the *Silver Summit*, *New Purim*, and *Rainbow* areas totaled 50,304 tons of silver-copper ore. The initial production in ground of *Rainbow Mining and Milling Company, Ltd.* totaled 5348 tons valued at $93,503. L. J. Randall of Wallace, Idaho, is president.

Deepening of the present two-compartment 70-foot shaft to the 120-foot point and opening a new 100 level is planned by *Richland Mines, Inc.* at its lead-silver-zinc-gold property near Placerville, Idaho in the Granite Creek mining district of Boise County. This would provide some 60 feet of stoping ground below the oxide zone. Henry L. Johnson of Boise is president, and William Olson of Boise, secretary-treasurer.

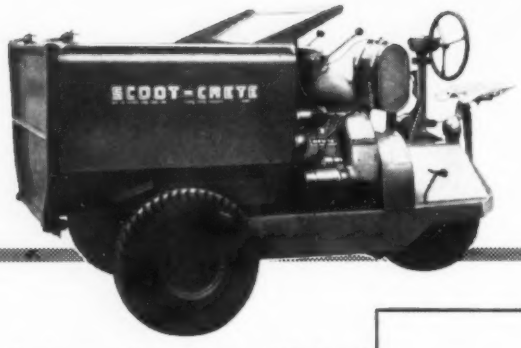
Pinnacle Exploration, Inc. is planning to resume exploratory work this season at holdings of *Uranium Mines, Inc.* of Wallace, Idaho in the silver-lead-copper region east of Mullan, Shoshone County, Idaho. Pinnacle is a subsidiary of *Callahan Zinc-Lead Company*, which is headed by Joseph T. Hall of New York City.

The deep development *Silver Mountain* project east of Mullan, Shoshone County, Idaho, now is requiring considerable rock bolting and some timbering. More than 10,000 feet of drifting and crosscutting remain to be completed. Scheduled for 1958 are some 1,800 feet of additional crosscutting to reach the Deadman shearing, 2,000 feet of drifting along this structure, and an additional 1,500 feet of northeasterly crosscutting for drill exploration of the downward projection of old *Snowstorm* copper mine ore bodies. *Hecla* and *Bunker Hill* mining companies are doing the work with aid from the Defense Minerals Exploration Administration.

Rare Metals Corporation of America plans to continue exploration work this summer on a large placer property the firm has had under two-year option. Located along the Bear Valley Creek in Valley County, Idaho, the property is accessible for exploration only in the summer months. During the latter part of last summer, Rare Metals churn drilled and sampled some 31 holes. Work has indicated the presence of euxenite, columbite, tantalite, monazite, zircon, and ilmenite.

Developing Small Washington Gold Mine

The Wind River Mining Company is developing a 21-claim, gold and silver property near Stevenson in Skamania County, Washington, discovered when the group were seeking uranium with the aid of a Geiger counter. The operators are now drifting along the vein which is from two to eight feet wide, with occasional pockets of gold ore encountered from time to time. This vein is one of four on the property—the others will be prospected later. In the photograph above of the company's operations, the vein crops out just behind the cabin, and extends into the hillside. The entrance to the 250-foot adit is hidden by the top of the ore chute below the roots of the fallen trees. Ore is dumped down the chute and stockpiled at the right. The firm hopes to have 15,000 tons of milling ore stockpiled by summer, for possible installation of a mill. Everett N. Philpott is president and mine superintendent.



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- **A full range of Aircooled Diesels from 5 to 310 BHP in 1, 2, 3, 4, 6, 8 and 12 cylinders, all with individual cylinder units and interchangeable heads**
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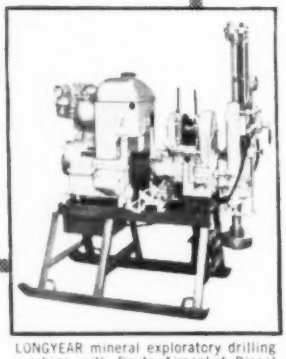
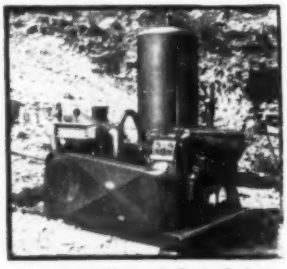


LONGYEAR mineral exploratory drilling machine with Deutz Aircooled Diesel Engine Unit uses Longyear Diamond Core Drill #24. Longyear selected Deutz for its compactness of design, fuel efficiency and excellent service and parts facilities.



Mine installation at Rock Springs, Arizona, uses ATLAS COPCO Compressor CT-6 with Deutz–6 cylinder A 6L/514 engine to assure top running efficiency in all temperatures. The semi-portable compressor provides 320 C.F.M.

PARTIAL SPECIFICATIONS TABLE

Model	Cont. BHP/Cont. RPM
F 1 L 612	10/2000
F 2 L 612	20/2000
F 3 L 612	30/2000
F 4 L 612	40/2000
F 6 L 612	60/2000
A/F 2 L 514	30/1600
A/F 3 L 514	45/1600
A 4 L 514	60/1800
A 6 L 514/614	90/1800
A 8 L 614	120/1800
A 12 L 614	180/1800

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MONTANA

Anaconda Company has virtually completed the new crushing plant, conveyor system, stockpile facilities, ore bins, and railroad yard for the *Berkeley Pit* at Butte, Montana and these should be in operation shortly. The ore mining rate at the Berkeley was increased gradually during the first half of last year and reached about 17,500 tons per day by July 1; this rate was then maintained for the balance of the year. Stripping was maintained at a relatively high rate in order to advance waste removal farther ahead of ore mining. This year, the firm also expects to start mining on the 800 and 1100 levels of the Kelley mine.

Vivian Brothers of Kellogg, Idaho are reported to be diamond drilling the *Carter Creek* iron mine so that ore reserves can be further evaluated. *Minerals Engineering Company* of Grand Junction, Colorado is the present owner of the property, which is located east of Dillon, Montana.

Underground hydraulic mining operations have been resumed at the old *Brooklyn* and *D-G* properties in Granite County, Montana's Maxville area. First project was to install a 14-inch water supply line to replace a six-inch line used last season when the unusual mining operation was successfully tested. The change is expected to increase production from 100 tons a day to about 300. Water under high pressure is used to wash down ore from a wide decomposed porphyry dike. Suction and gravity then carries the ore by pipeline to settling ponds. Overflow water carries away waste. Sampling of the first settling pond showed values of 8.9 percent zinc, 2.8 percent lead, 8.7 ounces of silver and 0.9 percent copper to the ton. *Silver Butte Mines, Ltd.*, a recently formed British Columbia firm, is operating the properties under an agreement with *Treasure State Uranium Company* of Helena, which holds a lease and bond from *Black and White Mining Company*. Canadians in the operating firm include B. O. Brynelsen and E. H. Lovitt, mining engineers, and Dr. Buckland, consulting geologist.

Reopening and deepening of the *Nancy Lee* lead-silver-copper-zinc mine, Mineral County, Montana, is planned by E. G. Smith of Osburn, Idaho, former lease operator of the property, with financial assistance from the owner, *Nancy Lee Mines, Inc.* of Kellogg, Idaho. Plans include rehabilitating 3,500 feet of adit and sinking a 250-foot, two-compartment shaft from the 640-foot level to gain depth on an ore body from which Smith last shipped in 1955.

Plans for the *Montana School of Mines* Stope-Fill Symposium are about complete. The symposium will be held May 9 and 10 on the campus in Butte, Montana. Tentative titles of the papers to be presented follow: Transportation of slurries in pipelines; Use of flocculants to improve percolation rates of tailings used in stope filling and rheological phenomena in slurries; Preparation of mine backfill using wet cyclones; Problems connected with pumping slurries up grade; Details of the hydraulic-fill mining method used at the *Mt. Con* mine, Butte; Sand filling at *Homestake* and associated problems of pipe wear; Hydraulic filling at *Chibuluma* mine, Northern Rhodesia; Hydraulic-filling in preventing or fighting mine fires in Butte; Suggested new hydraulic-fill mining methods; Pilot plant studies in determining flow characteristics of slurries; Use of boreholes to convey tailing fill.

Development of a copper vein in the Index mining district of Snohomish County, Washington has been undertaken by *Master Mines Company*. Core drilling of a uranium showing east of Mount Rainier, Pierce County, also is planned this summer. The company was organized by John and Edward Skusek, Tacoma geologists.

OREGON

Cinnabar prospecting has been undertaken on the *Manzanita* and *Bluetop* properties on Quartz Mountain in southeastern Lake County, Oregon, by lessees R. L. Adams Jr., Carl W. Lange, and Dean Lange.

Timber Beast Mining Company has started a uranium exploration project in Harney County, Oregon with aid from the *Defense Minerals Exploration Admin-*

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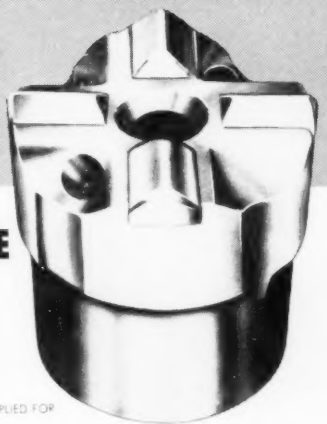

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istration. Expenditure of nearly $25,000 is planned. Officials include W. C. Teegarden and Charles Skeeters of Prospect.

Oregon Metallurigal Corporation is extending its capital structure to the extent of $2,500,000 for long-range expansion program at its Albany, Oregon plant. A $4,000,000 contract from *Westinghouse Electric Corporation* for zirconium ingots is approximately 50 percent completed. Stephen M. Shelton is excutive vice president.

WASHINGTON

Northwest Uranium Mines, Inc. has been seeking a review of an *Atomic Energy Commission* decision not to enter into a purchase contract for uranium ores which the firm proposed to mine and mill in the Spokane Indian Reservation, Stevens County, Washington. The Wallace, Idaho firm has drilled out an estimated 600,000 tons of ore near the surface. Clark L. Wilson of Salt Lake City, vice president, testified at a recent hearing of the Joint House-Senate Committee on Atomic Energy. He asked the committee to approve adjustments in policy which would enable his firm and others in a similar position to become productive. Meantime, the company has started to strip its deposit and will "high-grade it . . . so that we will have about 200,000 tons of 0.20 U_3O_8 available for mining," says Mr. Wilson. Shipments will be made on a custom basis to the mill of *Dawn Mining Company* at Ford, Washington.

Underground uranium mining operations are proceeding on a one-shift basis at the *Dahl* lease open-pit mine of *Daybreak Uranium, Inc.* in the Mount Spokane district, northern Spokane County, Washington. Excavated ore is stockpiled for shipment to *Dawn Mining Company's* uranium processing plant at Ford, Stevens County.

Inland Empire Mining Company is assembling a mill at Port Angeles, Washington on the Olympic Peninsula to process manganese ores from its nearby properties and to do custom milling. The plant will use a leaching method developed by the *U. S. Bureau of Mines* for processing of low-grade ore. Elder Lucier is superintendent. E. R. Gehrke, Port Angeles, is president, and M. E. Oldring, Port Angeles, secretary-treasurer.

A small body of high-grade uranium ore has been outlined by nine shallow drill holes at the Mount Spokane district property of *Spokane National Mines* obtained by taking over *Dahl Uranium, Inc.* in a merger. Drilling on *Dahl* ground in the Spokane Indian Reservation, Stevens County, Washington, has disclosed a wide mineralized section starting at a depth of 107 feet. George Allison of Casper, Wyoming is president.

Preliminary depth development of the *Gold Dollar* ore body near Republic, Ferry County, Washington, has been gratifying to management. The length, width, and grade of gold-silver ore disclosed on the new 9th and 10th levels were markedly better than at higher levels. The Gold Dollar is owned by *Day Mines, Inc.*, of Wallace, Idaho. The deep development is being carried on by *Knob Hill Mines* from its adjoining workings.

Howe Sound and Haile Mines To Merge Interests

Directors of Howe Sound Company of Salt Lake City, Utah, and Haile Mines Inc. of New York City have voted to merge the two firms, subject to approval by stockholders. Upon the merger, Haile stockholders will receive one share for each 2½ shares held, and Howe Sound stockholders one for one. The name of Howe Sound Company will continue.

The 55-year-old Howe Sound Company is the nation's largest producer of cobalt at its Blackbird mine in Idaho, and also operates lead-zinc properties in Chihuahua, Mexico.

Haile is the country's largest producer of tungsten concentrates and metallurgical grade manganese nodules. Early this year Haile acquired Frank Samuel & Co., ore mineral and chemical importers; Refractories Corporation of America; National Paint & Manganese Company; and controlling interest of Karl Lieberknecht, Inc., manufacturers of textile machinery.

Spokesmen for both firms point out that with combined net assets of more than $29,000,000, the consolidated company will be in a strong position to further integrate and diversify present operations.

Freeport Sulphur Company is developing the *Lake Pelto* sulphur deposit on the fringe of the Louisiana Gulf Coast, and hopes to be in production within two years. A number of additional wells have been drilled. Part of the preparation for mining included construction of a man-made island to accommodate the mining plant and facilities. At the firm's huge *Grand Isle* deposit in the Gulf of Mexico, production is expected to be underway by 1960.

American Zinc Lead and Smelting Company reports encouraging results to date on the drilling program in the Bourbon and Boss-Bixby areas of Missouri, being undertaken jointly with *Granite City Steel Company*. The firms have under option and lease in these areas about 9,242 acres. Two diamond drills and one churn drill were used on the properties during most of last year.

The *White Pine Copper Company's White Pine* mine and smaller *Freda* copper mine in Michigan produced 74,938,684 pounds of refined copper in 1957, compared with 80,426,212 pounds in the previous year. As of December 31, 1957, the government's obligation to purchase copper at the floor price of 25.5¢ per pound, subject to escalation changes, had been reduced from 487,500,000 pounds to 105,000,000 pounds.

Magnet Cove Barium Corporation has purchased a mineral dressing research laboratory and plant at Bauxite, Arkansas from the U. S. Bureau of Mines. Magcobar was highest bidder on the plant which was declared surplus by the government and offered for sale. The plant will be used for research on commercial uses of selected minerals. Purpose will be to improve the metallurgical processes at Magcobar's existing facilities and to develop new products.

A survey of the new Howell County, Missouri iron ore industry has shown that sales passed the $1,000,000 estimate for 1957. During that period, 2,805 carloads of ore were shipped from West Plains and Brandsville, bringing an estimated $981,750 to some 60 operators in the district. The survey did not include ore shipped from Willow Springs, Pomona, Koshkonong, and Thayer. The *Frisco Railroad Company* received nearly $500,000 for transporting the ore. The survey showed that steel companies paid mine owners and the railroad company a total of $1,481,750.

National Zinc Company of Bartlesville, Oklahoma has shut down one of its zinc furnaces blocks for repairs. Economic conditions in the zinc industry will determine when it will be started up again. This amounts to a reduction in output of 16 2/3 percent. The plant has six furnace blocks capable of producing about 3,500 tons of zinc monthly.

Lithium Corporation of America has supplied more than 90 percent of *Olin Mathieson Chemical Corporation's* lithium requirements to date, and plans to supply a similar proportion in 1958. Olin Mathieson uses the lithium in high energy fuel production for missiles and military aircraft.

The Proceedings of the Seventh Annual Drilling Symposium held at the University of Minnesota's Center for Continuation Study last October are now available. The planners of this conference believe it was the most successful yet sponsored in the series on exploration drilling. Those desiring to purchase a copy should contact Mr. Merrill Cragun at the Center for Continuation Study, University of Minnesota, Minneapolis 14.

The *U. S. Field Service* has been studying all mining claims in the Saline, and Perry County areas of the Ouachita National Forest in Arkansas, covering about 40,000 acres.

New Jersey Zinc Company's new mine at Friedensville, Pennsylvania has gone into production. The new 2,500-ton flotation mill is now making daily shipments of zinc concentrate to the smelter at Palmerton, Pennsylvania where it is processed into zinc metal and pigments. Friedensville is the third new property of the company to be placed in operation in the past few years. It is one of the most modern operations. Ore is crushed underground, loaded automatically, and raised to the surface by powerful hoists equipped with all modern safety controls.

Metal & Thermit Corporation rutile and ilmenite ore processing plant in Hanover County, near Richmond, Virginia, is now being production tested to provide samples for analysis and customer evaluation. The plant was completed in the last part of 1957. When in full production, the plant and mine are expected to supply 13 percent of the United States' rutile supply. The $1,250,000 project is located on an 800-acre tract.

A public hearing will be held on June 24, 1958 at 10 a.m. in the Hearing Room of the U.S. Tariff Commission Building in Washington, D.C. This hearing is part of an investigation undertaken at the request of the *Barium Reduction Corporation* of South Charleston, West Virginia to determine whether barium chloride is being imported into the United States in such increased quantities, either actual or relative, as to cause or threaten serious injury to the domestic industry producing this product.

Columbia-National Corporation has made its first lot shipment of nuclear-grade zirconium sponge to the AEC under the $22,750,000 contract the company

Open-Pit Mining for Kaolin in Georgia

This kaolin mine near Haphzibah, Georgia produces an average of 300,000 tons of ore annually for refractories, pottery, fine china, porcelain, and other industrial uses. The mine is owned by Albion Kaolin Division of Interchemical Corporation. In the photograph, an International Harvester 95 Payhauler can be seen hauling overburden to the waste dump at left, located about 1,500 feet from the stripping operations. The overburden is 60 feet deep covering a 14-foot layer of kaolin. One of these trucks moves about one-third of the 7,500 cubic yards of overburden hauled from the mine every 40 hours. Kaolin has already been mined from the pit in the center of the photograph.

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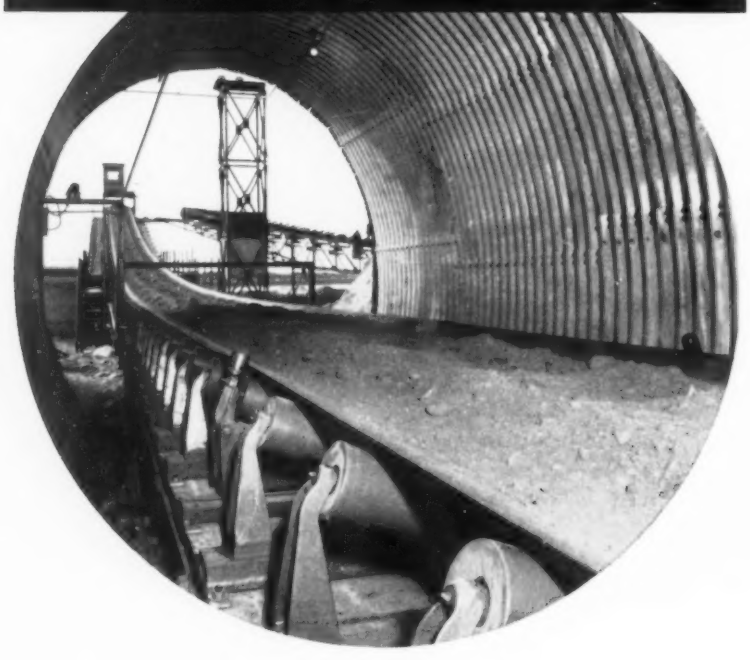

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holds for supply of 3,500,000 pounds of zirconium over a five-year period. Much of the metal reportedly will be used in construction of reactors for the Navy's atomic powered fleet. In addition to the 700,000 pound-per-year production capacity required for the AEC contract, the company's new plant in Santa Rosa County, near Pensacola, Florida can produce up to 800,000 pounds per year for civilian use.

The *Office of Defense Mobilization* announces that the long-term stockpile objective for zinc has been reached, and that no further purchases of zinc are authorized for the strategic stockpile. The goal was set in 1954 to eliminate in wartime any reliance on inaccessible foreign sources of supply. The long-term objective for lead is to be reached before the end of this fiscal year.

New Jersey Zinc Company's new *Jefferson City* mine in Tennessee was in full production in 1957. Because of excellent operating results and increased ore reserves, work was started on expanding the mill facilities to permit the doubling of the present rate of mine production by the end of 1958. At the company's *Flat Gap* mine at Treadway, construction of the mill was completed and development work sufficiently advanced to make this mine ready for production in 1958.

Inland Steel Company plans to build an experimental pilot plant for the smelting of iron ore by a new process at its plant in Indiana Harbor, Indiana. The new technique has been developed in the company's research labs over the last few years.

The *Matthiessen & Hegler Zinc Company* reduced its slab zinc production about 850 tons a month at its Meadowbrook, West Virginia smelter. This is in addition to the 1,000-ton-per-month reduction made last fall at its smelter in La Salle, Illinois.

American Smelting & Refining Company is adding a new wing to its central research laboratories at South Plainfield, New Jersey to house the asbestos research laboratory. The company will undertake studies on asbestos as part of an assistance program for *Lake Asbestos of Quebec*, an operating subsidiary of ASARCO. The company is developing extensive deposits of high-quality chrysotile asbestos at Black Lake in Quebec and building a mill, as part of a company diversification program.

The Firth Chair of Metallurgical Engineering has been established at the Carnegie Institute of Technology in Pittsburgh, Pennsylvania by *Firth Sterling Inc.*, producer of tool and die steels, high-speed steels, sintered tungsten carbides, high temperature alloys, super alloys, and zirconium. Dr. Harold W. Paxton, assistant professor of metallurgical engineering, and research metallurgical engineer in the Metals Research Laboratory at the Institute will occupy the chair.

Aluminum Company of America has discontinued its search for alumina-bearing ores on 31,000 acres of land under option near Spartansburg, South Carolina. *Piedmont Properties*, organized by Alcoa to conduct the investigation, reported that the results of drilling did not justify continuance of the project.

Kentucky-Tennessee Clay Company is operating a large clay pit in the Mississippi River bluff about three miles southeast of Crenshaw, Panola County, Missis-

sippi. The company's headquarters are in Mayfield, Kentucky and Paris, Tennessee. The clay is processed and sacked for shipment at a small plant near the mine.

IRON RANGES

National Steel Corporation has acquired a little more than 80 percent of the *Teal Lake Iron Mining Company* at Teal Lake, Michigan. The property contains a substantial quantity of hematite ore with an average iron content of about 39 percent, which can be converted into a high-grade concentrate, according to the firm.

The iron mining companies on the Mesabi Range are getting off to a late start this year because of the decrease in steel sales and subsequent decrease in iron ore production forecasts for 1958. Where the shipping season usually starts in April, most iron ore companies are now planning loading operations for early May and mid-May. Winter stripping programs were of the shortest duration in the past few years. The overall projected 1958 production picture on the Minnesota Iron Ranges indicates a sharp decrease in iron ore shipments. R. T. Elstad president of *Oliver Iron Mining Division, U. S. Steel Corporation*, recently announced an expected 30 percent drop in Oliver ore production for 1958 compared to 1957. All other major companies are planning a similar tonnage reduction at this writing, while many of the minor companies may not produce any ores during 1958. In conjunction with this production cutback, many of the companies have placed their men on a 4-day work week and have also laid off considerable numbers of the younger employees.

Mesabi Iron Company has rejected the 1957 annual report of *Reserve Mining Company* on the grounds that the report "is not in accordance with the contract between the two companies." A dispute between the two firms has been in arbitration since April 1957. Reserve mines and processes taconite ore on property in Minnesota leased from Mesabi, which, in turn, is entitled to one-third of the profits derived from the operation. Mesabi rejected the 1956 report because of the method of accounting, and says the same methods are used in the 1957 report except for the five areas arbitrated last year. Among the remaining points of disagreement are those relating to the value of processed taconite pellets, the inclusion of profits from the railroad electric profit, loading of pellets, and the deduction of interest and finance expense.

Dedication of a new pilot processing plant took place recently when The Oreclone Concentrating Company officially opened its new research laboratory. This process consists mainly of Oreclone Concentrators for the upgrading of fine tailings deposited throughout the Mesaba Range. The company has been treating various ores from various areas of the Range and will treat tailings at the Prindle Mine, Virginia, Minnesota, during the 1958 season. Minnesota's Governor Orville L. Freeman assisted in the dedication ceremonies at the Virginia, Minnesota laboratory. Norman Rodman is general superintendent of the new operation.

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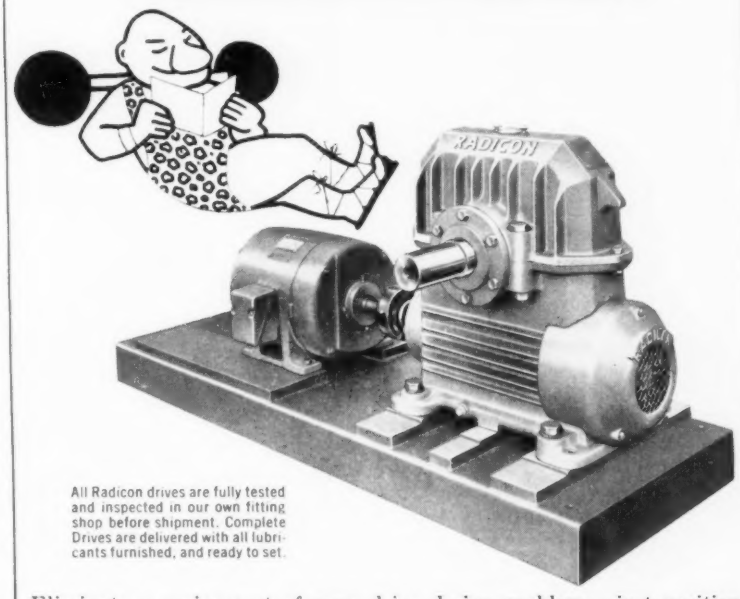

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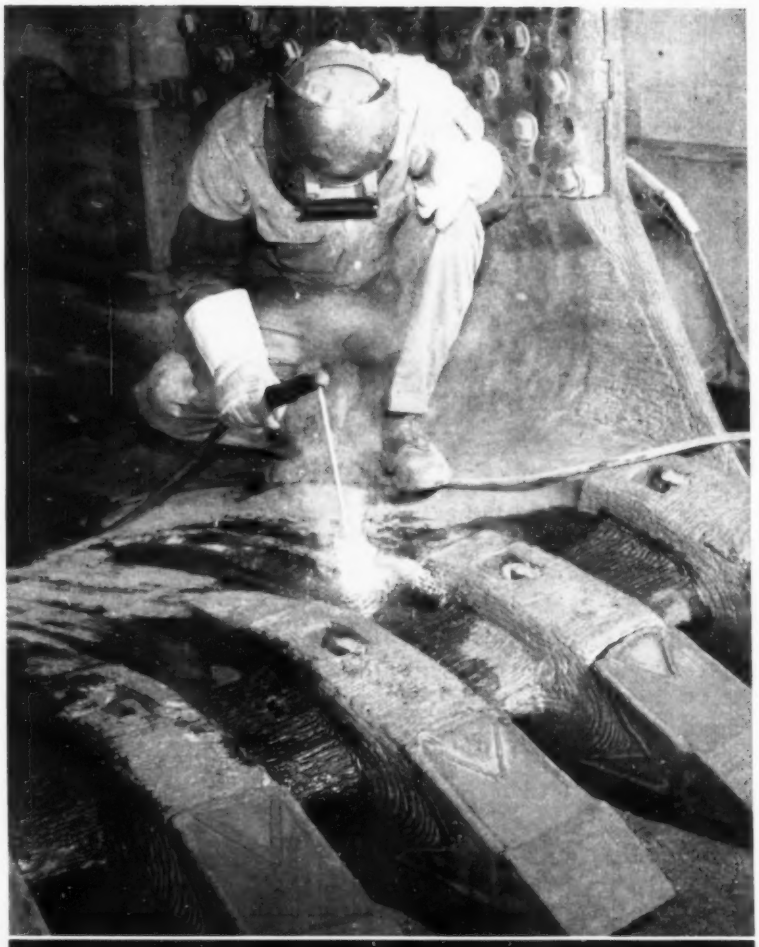

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ARIZONA

Stoping operations at the *Childs-Aldwinkle* mine in the Bunker Hill district of Pinal County, Arizona, have been producing about 100 tons daily of copper sulphide ores. The ore is then trucked to the Old Reliable mill for treatment. About 20 men are employed, 16 at the mine on a three-shift basis, and four at the mill on a two-shift schedule. R. A. Burney of Oracle, Arizona is superintendent in charge of the work.

One carload of flux ore is being shipped daily to the Hayden Smelter of *American Smelting and Refining Company* from the *Chillito Copper Company's* property, north of Hayden, Arizona. The ore is said to average 75 percent silica. Mike Guisman of Superior, Arizona, is agent for the company.

Nash and McFarland are mining and milling approximately 150 tons daily of lead and zinc ore from their lease on the *Flux* mine of *American Smelting and Refining Company*, near Patagonia, Arizona. The ore is milled in the Trench mill which was purchased; the resulting lead concentrates are shipped to the Asarco smelter at El Paso, and the zinc concentrates to Asarco at Amarillo. Eight lead cells and 10 zinc cells are used for the flotation process. The mine and mill crew totals 34 men, with one shift working daily in the mine and two shifts at the mill. Operations are directed by E. W. McFarland, mine manager, of Nogales, Arizona. D. C. Gilbert is consulting geologist.

The *Blue Jester Mines, Inc.* is operating the *Black Jack* manganese mine, 43 miles south of Casa Grande, Arizona. Since leasing the property last July, present operators have deepened the 75-foot inclined shaft to the 100-foot level and completed more than 250 feet of drifting on the 100 level. This drifting, which has been principally in ore, is providing a daily production of 10 to 15 tons. The ore is trucked to the *Mohave Mining and Milling Company* at Wickenburg for sintering and marketing under the GSA carload manganese program. Principals in the company are Russell A. Wright of Phoenix, and Harrison C. Smith of Globe. Owen Wade of Tempe is foreman. Eleven men are employed.

Pima County Superior Court Judge Lee Garrett at Tucson has upheld an Arizona Land Department decision that James A. Woolsey, of Tucson, has no claim on the $12,000,000 copper pit of the *Pima Mining Company*. Woolsey, a 37-year-old miner and prospector, indicated he would take his case to the Arizona Supreme Court. The trial was on an appeal of the land department decision rejecting Woolsey's claims. The land on which the *Pima* mine operates is located near Tucson and is owned by the state.

Cyprus Mines Corporation has closed its mining operations at the *Old Dick* property near Bagdad, Arizona. The mine, which had been employing a crew of 55 men, will retain only a small force for sinking the shaft for development of a new level. Curtis Sundeen, manager, stated that the drop in metal prices was responsible for the shutdown and that if and when prices improve the corporation plans to reopen and resume operations.

Metate Asbestos Corporation is building a $150,000 asbestos processing plant near Globe, Arizona. The plant will process low-grade fibers for industrial use. Metate operates two mills on the San Carlos Indian Reservation which process only high-grade crude fiber for the government stockpile. The government agreement to purchase this type of asbestos expires June 30, but attempts are being made to gain an extension. Funds appropriated for this program still have not been used. The asbestos producers hope to continue the purchase program long enough for them to convert to commercial activities.

Government purchases of copper produced by *San Manuel Copper Corporation* are expected to continue for another three years if necessary, under the DMPA contract negotiated in 1952. The government is paying 27.05¢ per pound, based on the 24¢ floor price and 3.05¢ for escalation. The company points out that although the contract price has increased about 12.7 percent since 1952, production costs have increased approximately 33.1 percent; the contract price escalation does not fully compensate for the increased production costs. The govern-

Union Carbide Leases Nevada Vanadium Claims

Union Carbide Nuclear Company has signed a lease and bond on 22 vanadium claims of Mr. and Mrs. Richard McKay and Mr. and Mrs. Lester A. Bisoni of Eureka, Nevada. Carbide Nuclear has also staked 64 claims adjoining the discovery which is on the east slope of the Antelope Range in northern Nye County. See arrow on map for the township in which the claims have been staked according to location certificates in the Nye County recorder's office in Tonopah. McKay and Bisoni were prospecting for uranium when they found brightly colored orange and yellow minerals cropping out. Tests proved the minerals not to be uranium but they contained vanadium.

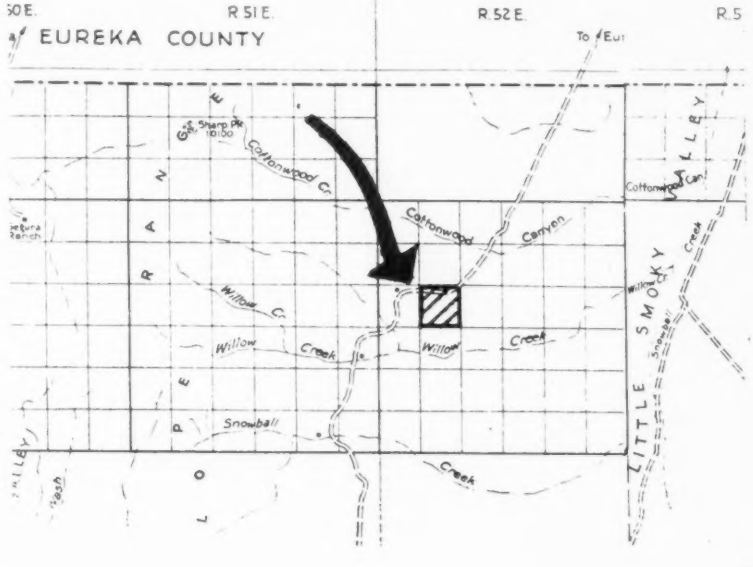
Primary mineral or minerals have not yet been identified. Most minerals so far identified are apparently all hydrated calcium vanadates (hewettite, metahewettite, metarossite, pascoite, and rossite). They all have varying proportions of CaO, V_2O_5, and water of crystallization. Their colors vary from red, reddish, pale yellow, pale orange, orange, and clear yellow. The minerals are found in limestone, limey shales, and shales apparently of Cambrian, Ordovician, and Silurian age. At least this is age given to sedimentary series at Tybo. One geologist has reported the occurrence to be somewhat similar to vanadium found in the siltstone beds of the Phosphoria formation of western Wyoming.

According to William H. Kohler, assistant manager exploration for Carbide Nuclear, diamond drilling, bulldozing, and geophysical (geochemical) exploration is underway to delimit and evaluate the discovery.

There is no organized mining district in the vicinity of the mine nor are there any records of mineral occurrences in the nearby area. Nearest metal production was silver-gold from veins in porphyritic quartz latite at the old camp of Morey 20 miles south. Further south (about 45 miles from vanadium discovery) is the well known lead-zinc camp of Tybo where ore was mined from bodies along faults which replaced dikes of quartz latite porphyry. These dikes are similar to the Tertiary quartz latites north of Morey.

This is the third reported vanadium occurrence in Nevada. To the north of the discovery vanadium-bearing asphalites have been reported in Clark County. Vanadanites have been found and mined in Clark County. To date there has not been enough work done to connect the Eureka County occurrences with this new Nye County discovery.

It is a most interesting discovery—made by smart prospectors, too. It will take time to evaluate the discovery and to determine if commercial production can be made from what appears from work done to date to be low-grade mineralization.



ment contract has been amended to remove any obligation or right to sell molybdenum concentrates to the government. All such production has been sold through December 31, 1959. Molybdenum production at San Manuel has been and is expected to be substantially less than originally estimated, but may improve in the future. Gold and silver production has been slightly better than expected.

Fairview Placers, a joint operation of *Sunshine Mining Company* and *Canadian Dredging Company*, was to terminate its operation in the Trinity River area of California on April 1 because of construction of the Trinity River Dam. No settlement had been concluded with the government at this writing, but negotiations were continuing. Production from Fairview Placers was limited to the last half of last year. The dredge which had partially capsized and sunk in December 1956, was raised and righted by early March 1957, but final repairs were not completed and the dredge was not back in operation until June. From then until the end of the year, 1,037,906 cubic yards of gravel were dredged to recover 4,186 ounces of gold.

New Idria Mining & Chemical Company of Idria, California reported a net loss for 1957 of $1,025,502. The tungsten and oil and gas divisions operated at a loss, but the quicksilver and uranium divisions recorded profits. Most encouraging results came from the quicksilver operations at Idria where the firm has developed "important new reserves of mercury ore." Though the *Strawberry* tungsten mine near Fresno, California has been shut down because of Congressional failure to appropriate funds for a federal purchase plan, the mine has been kept in operating condition pending an eventual return to production. Prior to closure, a large tonnage of high-grade ore had been encountered, along with location of a surface deposit.

Tennessee Gas Transmission Company of Houston, Texas has signed a letter of intent to acquire majority interest in *Grand Central Rocket Company* of Redlands, California. Grand Central makes the third-stage rocket motor for the Navy's Vanguard earth satellite project. Significance of the consolidation lies in the fact that Tennessee Gas's large resources will aid in expansion of Grand Rocket's solid propellant and solid rocket motor projects.

Though the *United States Borax & Chemical Corporation* reported a loss for the three-month period ended December 31, 1957, most of this was attributable to the heavy non-recurring expenses in connection with the new plants at Boron, California. It was also necessary to continue partial borax operations at the old plant in Wilmington at the same time, entailing dual staff expenses. The latter operation has now ceased. A large lithium reserve is present in the waste shales associated with the borax deposit at Boron and the company has a practical extraction process for lithium recovery, but the management does not feel the market outlook justifies a plant for this purpose at this time.

A Calaveras County, California jury recently held mine owners responsible for polluting of Moore Creek, a tributary of the Mokelumne River, even though the property was being operated by other persons at the time. The *Moore Creek Mining Company* was fined $500 but the fine was suspended on condition that the company prevent any more pollution of the creek either from its mill or from tailing piles that now exist in the canyon of the Little Moore Creek.

Kaiser Steel Corporation produced 2,635,000 tons of iron ore during 1957, the second highest output in the history of the *Eagle Mountain* mine. Late in the fall, the firm's new addition to the beneficiation plant went into operation. The new jig concentrating plant is designed to process small sizes of ore and will result in further upgrading of the iron content of ore shipped to the steel mill at Fontana, California.

Harvey Machine Company Inc. at Torrance, California has officially changed its name to *Harvey Aluminum*. The change is in order to identify more closely with the numerous aluminum products, and its aluminum facilities at Salem and The Dalles, Oregon and at Milan, Tennessee.

Calaveras Cement Company has exercised its four options to purchase acreage and mining claims totaling about 550 acres in the Redding area of California, east of Highway 99 and south of Shasta Lake. The properties are being purchased for their limestone deposits as a part of a long-range program of adding to re-

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serves. Calaveras holds options on several other properties in the area as potential sites for a new cement plant but no decision about exercising them has been made.

NEVADA

Standard Slag Company of Gabbs, Nevada is reported to have taken a lease and option on a large block of uranium claims near Mountain City, Nevada. The properties involved are the *Lucky Lager, California Creek, Race Track,* and *Top* groups, held by Thomas White, Ray Moores, and Don McEachern. Drilling is underway, and some shipments are to be made soon by the new management.

Wah Chang Mining Corporation is examining a fluorspar property near Beatty, Nevada in southern Nye County. It is reported that if the findings are favorable, Wah Chang may move its tungsten mill at Tempiute to the Beatty area and convert it to fluorspar processing.

Also seeking fluorspar in Nye County, Nevada is a Portland, Oregon firm, *Fluorspar Corporation of America.* This group has 79 claims, located about 70 miles east of Tonopah. Analysis of ore samples from the property is said to have shown 62.3 percent fluorspar. The firm is headed by Sol Goldberg and Jack A. DeMeat.

Lookout Mountain Mining and Milling Company and *Caledonia Silver-Lead Mining Company,* both of Kellogg, Idaho, are diversifying their mining fields. One step has been to option a silver property near Fallon, Nevada. Both have been interested mostly in uranium, lead, and zinc until now.

Eureka Corporation has removed the pumps in its TL shaft and is permitting the lower levels of the mine to flood. *Richmond-Eureka Mining Company,* owner of the claims, has requested strict compliance of the work schedule and threatened termination of the lease under the amending agreement expiring April 30, 1958. Eureka management said this was neither reasonable nor practical, and that the "directors do not see any reasonable possibility of developing a profitable mine in the Fad shaft area, and do not consider that further drilling in the hope of increasing indicated tonnage, or other work in the Fad shaft area is justified." Pending decision on this, work is continuing to meet lease requirements.

The old *Silver Cloud* mercury mine, now known as the *Clipper* group of claims, 32 miles north of Battle Mountain in Elko County, Nevada, is being reopened. Horace T. Jones of Salt Lake City is reported to have purchased the property from Mrs. Alfreda Pangborn of Battle Mountain. A bulldozer is at work on the property and drilling is to be undertaken soon. It is said that Mr. Jones plans to install a Crocker rotary kiln, power plant, and crusher.

Mr. and Mrs. Marion Fisher and Claud Taylor of Battle Mountain, Nevada, and Mr. and Mrs. Harry W. Treweek of Beowawe have acquired a lease and option to buy the 22 gold mining claims in Elko County known as the *Bootstrap* mine. Some $75,000 has been spent on the

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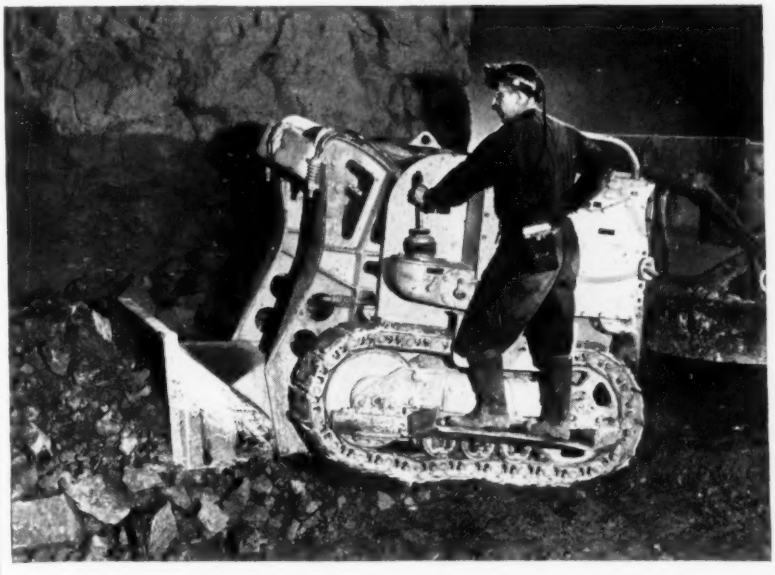

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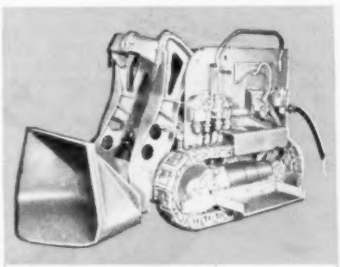
Above: JSL-7 Shovel Loader, electric model, loading into Joy Rock Shuttle Car in Midwest metal mine. Below: Air motor model JSL-7 Loader.



JOY JSL-7 Loader	Specs
Height, minimum.....	60″
Headroom Range.....	81″ to 114″
Width, overall.....	57½″
w/platform.....	69″
Length, with bucket in digging position....	112½″
Weight, Air.....	9,650 lbs.
Electric.....	11,250 lbs.
Loading, average.....	2—4 tpm

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property over the years since R. R. Reed of Fallon first opened it. A 100-ton mill is to be completed on the property which is to be mined with power shovels in an open pit.

NEW MEXICO

Boyles Brothers Drilling Company of Salt Lake City is sinking two more shafts for *Phillips Petroleum Company* in the Ambrosia Lake district of New Mexico. The 1,750-ton-per-day mill is being rushed to completion by *Western Machinery Company*. In another section of the Ambrosia Lake district, additional properties have been added to the *Phillips-United Western Minerals* farmout agreement. Phillips has started 200,000 feet of drilling to explore these properties: Sec. 2, T. 14 N., R. 11 W.; Sec. 36, T. 16 N., R. 12 W.; Sec. 32, T. 16 N., R. 11 W.; Sec. 16, T. 15 N., R. 12 W.; Sec. 32, T. 15 N., R. 9 W.

Melvin E. Richards, president of *Yucca Mining & Petroleum Company*, reports that the DMEA has granted a loan to *Lisbon Uranium Company, E. J. Longyear Company*, and *Minerals Project Ventures B* for exploration of the *San Mateo Dome* the group leases from Yucca in the Grants area of New Mexico. The group have already spent about $600,000 to block out the ore. An additional $200,000 is to be spent now. Yucca owns 22 sections on San Mateo Dome and holds a 10 percent royalty on most of the acreage. In addition, Yucca owns another 20,000 acres in the Grants area, a portion of which has been leased to *Phillips Petroleum Company*.

Los Compadres Mining Company of Ajo Caliente, New Mexico has started mining for mica in Taos County. The operation is centered in Sec. 13, T. 14 N., R. 8 E, about one mile from Ajo Caliente and adjacent to U. S. Highway No. 285. Production will be marketed for roofing purposes. Verne Byrne of Santa Fe is superintendent of operations.

United Western Minerals Company's drilling program on Sec. 14, T. 13 N., R. 9 W., in the Ambrosia Lake uranium district of New Mexico has been completed and mining and development plans are now underway. A shaft is being sunk and headframe and hoist installed. Production is expected to start about the first of July. The ore will be shipped to the *Homestake-New Mexico Partners'* mill.

The 1,500-ton-per-day uranium processing mill being built by *Homestake-Sapin Partners* in the Ambrosia Lake district is expected to be in operation by the middle of the year. It will take about a full year for it to reach capacity, however, because it will be necessary to develop mine production.

U. S. Borax & Chemical Corporation at Carlsbad, New Mexico has installed a German Humboldt Centrifuge in its granular plant on an experimental basis. It is scheduled for considerably more operational observation before any decision is made, but at this point it has been so successful that it might eventually replace all four of the Bird solid bowl centrifuges which have been in use for years. This new centrifuge is sold through the *Bird Company* in Massachusetts. It is a vertical installation whereas the old Birds are horizontal.

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TEXAS

Texas Gulf Sulphur Company expects its new Frasch-process plant at Fannett Dome, Texas to go into production by the middle of this year. This is the fifth new sulphur plant the company has built in the last 10 years.

Dow Chemical Company has suspended magnesium production indefinitely at its Plant B at Freeport, Texas. Plant A will continue in operation.

National Lead Company has reduced the price of antimony by 4¢ per pound. This is the first change in price since August 17, 1955 when the prices were raised 4½¢ per pound. New price for the R.M.M. brand is 29¢ per pound f.o.b. Laredo, Texas. Reason for the price decrease is reduced demand for the metal.

All of *Reynolds Metals Company's* requirements for fluorspar, used in making cryolite and aluminum fluoride for reduction plants, are now supplied by new fluorspar mines in Mexico and a flotation mill at Eagle Pass, Texas, which went into operation in 1957.

AEC Will Expand Market For Domestic Uranium

The United States Atomic Energy Commission has announced plans to increase purchases of domestic uranium to a limited extent to provide an additional market for ore reserves developed before November 1, 1957. As a result, domestic milling capacity is expected to increase by a proposed 3,300 tons of ore per day with new mill contracts awarded, and annual concentrate production will show an increase of about 2,500 tons of U_3O_8.

Following an announcement made last October of AEC's policy to limit further expansion of domestic production, a study was made by the AEC of existing market problems of uranium producers. The study showed that five areas have no market or an inadequate market and estimated minimum requirements for additional mill capacities in these areas to be: Southeast Texas, 600 tons per day; North Dakota-South Dakota, lignite, 600 tons per day; Wyoming, 1,700 tons per day; Colorado Front Range, 200 tons per day; and Nevada, 200 tons per day.

Six areas, White Canyon-Monument Valley in Utah and Arizona, Eastern Wyoming-Black Hills, South Dakota, Salt Lake City, Utah, Moab, Utah, Grants, New Mexico, and Spokane, Washington were reported to have adequate mill capacity if it can be distributed equally among the mining properties.

The Uravan Mineral Belt in Colorado, Cameron district in Arizona, Shiprock district in New Mexico, Lakeview, Oregon, and Baggs-Maybell area in Wyoming Colorado, were said to have an adequate market for ore production, and no problems were expected.

The Commission emphasized that new capacity would be kept at a minimum to prevent over-expansion of uranium production facilities in this country.

A study of the possibility of licensing private uranium sales, with appropriate safeguards to assure that material sold would be used for peaceful purposes, is now underway.

It is anticipated that the AEC will ask Congress to allocate necessary funds to carry out this mill expansion program.

Two recent ore discoveries have been reported in the gold mining operations in the Cripple Creek district of Colorado. One development centers on the third level of the *El Paso* mine in which strikes were reported by the *Beacon Hills Mine Company*. In another development, an ore body was reported found in the 31st level of the *Ajax* mine, and opened for a distance of about 200 feet. C. H. Carlton, mine manager for *Golden Cycle Corporation*, said that some ore shoots have also been opened up on the 30th level, as well as three levels above that. He said that about 500 feet of stoping area will be mined.

Molybdenum ore production was reduced about 34,000 tons weekly at the mining and milling operations of the *Climax Molybdenum Company* division of *American Metal Climax, Inc.* at Climax, Colorado when the firm began a five-day work week schedule. One of the reasons for the reduction in operations was explained by Robert Henderson, resident manager, who said the company has "above normal" inventory of concentrate totaling about 11,400,000 pounds of contained molybdenum, which represents three-to five-month supply. Climax sales in 1957 were about 3,000,000 pounds a month.

Mineral Concentrates Inc. of Denver reports it plans to erect a $250,000 beryllium processing plant in Loveland, Colorado with production scheduled for June. The plant is to produce beryllium hydroxide from beryl ore mined in the Crystal Mountain area about 35 miles northwest of town. According to L. Bernard Davis, president of the company, five companies plan to mine in the district. They are: *Allphin Mining Company, Sterling Beryllium and Oil Corporation, American Beryllium Corporation, Keystone Beryllium Corporation*, and *Consolidated Gold-Uranium Corporation*. Mr. Davis is also reported to have said that the company will purchase ore containing as low as 4.0 percent beryllium.

Under terms of a new AEC contract, *Vanadium Corporation of America* will process an estimated 700 to 750 tons of uranium ore daily at Durango, Colorado. This means expanding the 430-ton plant, and the company will convert to solvent extraction during the changeover, instead of the former soda and acid leach processes. The company's Naturita 350-ton plant was closed recently, but an ore buying station will be maintained there.

Idarado Mining Company increased its ore reserves by 200,000 tons at the end of 1957. During the year, the company milled 457,850 tons of ore, averaging 0.062 ounce gold, 1.96 ounces silver, 1.98 percent lead, 0.78 percent copper, and 3.26 percent zinc per ton, compared with 481,700 tons in 1956, and 274,550 tons in 1955. Centralized milling at the new Pandora mill and improvements in mining efficiency aided the company in maintaining a profitable operation throughout the year, despite the sharp reduction in base metal prices. Current operations are being conducted on a five-day week basis at a scheduled rate of 35,000 tons ore per month, as compared with installed capacity of 45,000 tons monthly.

Vanadium Corporation of America has acquired the *New Verde Mines Company's* uranium prospect in Colorado on a profit-sharing basis. The property suffered a net loss in 1957 of $234,077. New Verde and its parent company, *Empire Star Mines Company*, were acquired by *Newmont Mining Corporation* in 1957 through a merger.

Mining operations at the *Cresson* gold mine in the Cripple Creek district of Colorado were halted for two days in March because of a hoist breakdown in the main shaft. The accident occurred when 15 miners were working on the 21st, 22nd, and 23rd levels of the mine operated by the *Cresson Consolidated Gold Mining & Milling Company*. The miners escaped from being trapped in the mine by walking through an emergency tunnel to the adjoining *Ajax* mine. A hoist counterweight jumped the track and jammed into timbered cribbing in the main shaft. Recently Cresson's president, Merrill E. Shoup, announced that the company faces a decision of whether to operate the Cresson mine since ore discoveries at lower levels continued disappointing and the firm sustained a loss of $29,355 in its operations last year.

A 2,000-foot crosscut is being driven from the *Radon* uranium mine in the Big Indian district, San Juan County, Utah, to a drilled ore body on the adjoining *Hot Rock* claims. *Hecla Mining Company* of Wallace, Idaho, is doing the work for *Radorock Resources, Inc.*, owner of the properties. Radon production in 1957 totaled 62,143 tons assaying 0.85 percent uranium oxide.

Cardiff Mining & Milling Company, working in the Alta district of Utah, re-

Camp Bird Options Wyoming Uranium Claims

Two States Uranium Corporation and Valley Dean Corporation, both of Bountiful, Utah, have given options on several Gas Hills claims in Wyoming to Camp Bird Ltd., an English Corporation. The latter will conduct further drilling and evaluation work, and will pay nearly $600,000 in cash, plus royalties, if the options are exercised. The Valley Dean open-pit, uranium mine, pictured above, is one of the few open pits in the Gas Hills where stripping and mining are done exclusively by Caterpillar DW-20 tractors with No. 456 scrapers. Normal procedure in the district has called for stripping with a variety of scraper units and then ore is loaded by shovels.

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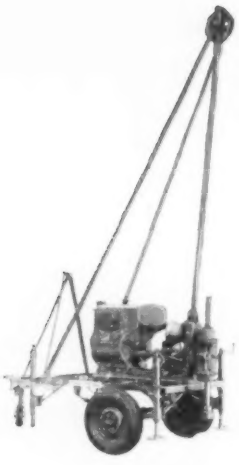

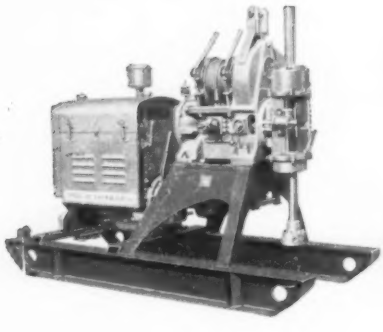

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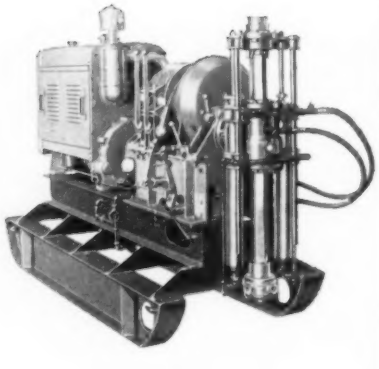

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ports a lead-zinc-silver strike made during a cross cutting operation. Additional exploration and development work will have to be done before the full potential of the strike can be determined. The company is leasing the *Columbus-Rexall* property in the area.

Texas-Zinc Minerals Corporation has completed removal of 750,000 yards of overburden from its *Happy Jack* uranium mine in White Canyon, San Juan County, Utah. Mining is now underway from the open pit, under the direction of *Isbell Construction Company* of Reno, Nevada which also handled the stripping. It is possible that the firm will revert to underground mining when it is no longer possible to carry out open pitting because of the steep slopes.

The Fifth Annual Meeting of the *Rocky Mountain Minerals Conference* will be held at the Newhouse Hotel in Salt Lake City, Utah on September 17, 18, and 19. Special sessions will be devoted to current mining, metallurgical, and petroleum engineering problems. Governor George B. Clyde of Utah will address the welcoming luncheon. A. J. Thuli, Jr. of *Kennecott Copper Corporation* is general chairman of the conference.

The Supreme Court of Utah has ruled that it is entirely legitimate to rely upon Geiger counters and similar instruments as one means of locating uranium, and discoveries by this means constitute a legal claim. The claim in dispute was located in San Juan County, Utah. First discoveror based his claim on Geiger counter determination; later a second locator claimed that such discovery was illegal.

Hidden Splendor Mining Company expects uranium production in 1958 to be about 7,000 tons monthly from its Ike and Columbia shafts in the Big Indian district of Utah. Ore from the Ike averages 0.72 percent U_3O_8, and from the Columbia it averages 0.35. Exploration around the Ike has also produced additional reserves which are still being evaluated.

The *Bureau of Land Management* has opened several thousand acres of public land for mineral leasing. The tracts are

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WYOMING

Western-Knapp Engineering Company of San Francisco received the contract for construction of the uranium ore processing mill of *Fremont Minerals, Inc.* at Riverton, Wyoming. The mill is to be built at a cost of $3,500,000 and will process 550 tons of ore daily, including the high-lime ores of the Little Mountain area of northern Wyoming, as well as the sandstone-blue shale ores from the Gas Hills. H. L. Hazen, Inc. of Denver, developed the process and operational design for the plant. Completion is scheduled for December.

The *Atomic Energy Commission* announced that uranium reserves in Wyoming had increased to 9,200,000 tons by December 31, 1957. One year ago the state's reserves were estimated at 2,300,000 tons. The Wyoming ores have an average grade of 0.26 U_3O_8. Of the total, 9,530,000 were placed in the Gas Hills and Crooks Gap areas of Fremont and Natrona counties, and 1,500,000 in outlying areas of central Wyoming, principally in the recently developed Shirley Basin field.

Uredco Associates, Limited have completed one half of the first phase of a 57,000-foot D.M.E.A. development program on the Rim claims in the East Gas Hills of Wyoming.

Reynolds Mining Corporation, a subsidiary of *Reynolds Metals Company*, exercised its options on 7,300 additional acres in the Lake DeSmet area of Wyoming, including the lake itself. The property is adjacent to large coal deposits, and is being acquired as a potential power site for possible future expansion of Reynolds' aluminum reduction facilities.

The *Wyoming Mining Association* held its third annual convention at Casper April 17-19. Wyoming Governor Milward L. Simpson was featured speaker. Lyman Fearn, state mines inspector and representative of the United States Bureau of Mines, reported on operations under the mining code in the first year since its adoption. R. L. Moran, Riverton attorney and president of the association, presided.

Robert F. Blanks, general manager of the *Great Western Aggregates* plant at Laramie, Wyoming, reports his firm has shipped over 100,000 cubic yards of lightweight concrete aggregates since it went into full production in March 1957, and expects to double that output in 1958. Shipping costs from Laramie have totaled $250,000, with the product going to New Mexico, Oklahoma, Illinois, Nebraska, Utah, Colorado, and Montana, as well as to points in Wyoming. He said 23,000 cubic yards of the aggregate were used by the Air Force Academy at Colorado Springs for one building.

Uranium exploration in Fremont County, Wyoming has fanned into the Sweetwater River area east of Atlantic City; W. W. Spees of Riverton filed 114 lode mining claims with the county clerk's office at Lander.

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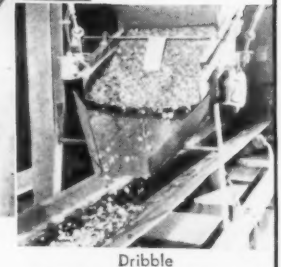

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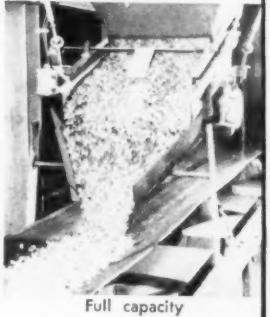

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Little Missouri Mining Company Inc. has received a DMEA contract for uranium exploration in Fremont County, Wyoming. The contract load is for $21,120, of which the government's share is $15,840.

A new mining company, *Marlock Mining Corporation*, has been formed by E. L. Lockhart and Marion Lockhart who plan to mine a small ore body located near Douglas, Wyoming. E. L. Lockhart has been field superintendent for *Globe Mining Company*. He plans to ship ore both to Edgemont and to *Fremont Minerals, Inc.* at Riverton.

Washakie Exploration, Inc., which holds leases on the Wind River Indian Reservation north of Lander, Wyoming, has filed notice with the Secretary of State to change its name to *Western Standard Uranium, Inc.* and to expand its operations to all states and territories.

Vipont Mining Company of Lander, Wyoming has given an option to lease 980 uranium lode claims in the Gas Hills to *United Western Minerals* of Delaware. Owners signing the agreement were Henry Hudspeth Sr., Richard Ellerby, Robert Sielaff, and Maynard Starrett. The option on 329 claims expires April 1, 1958, and on the other 651 claims expires July 26, 1959. Vipont has also purchased a one-sixth interest in 124 uranium claims in the South Gas Hills area from Jerry and Lois Ruzicka of Lander.

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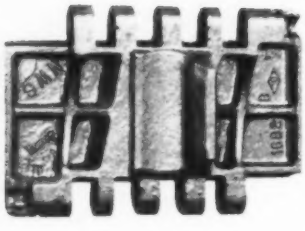

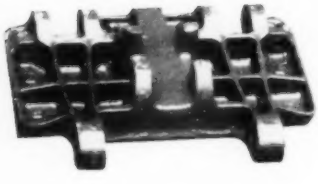

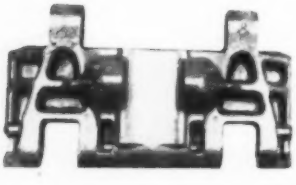

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New Tin Field Discovered In Northern Australia

Increased exploration for tin in Australia has led to the discovery of several deposits in an area called the Mount Harris tin field located in northern Australia, about 120 miles southeast of Darwin, Northern Territory. The lodes occupy faults having a strike of 15° to 18° northwest and a 75° dip to the west. The length of one lode has been traced approximately 1,500 feet along the fault, but indications show that the lode continues farther in both directions. The tin occurs as coarse grains in laterite and fine grains in hematite.

A bulk sample of 120 tons taken from trenches on the lode yielded 12.7 percent cassiterite SnO_2; samples taken for assay from surfaces exposed after removal of the 120 tons assayed 11.8 per-SnO_2. A sample of 18 tons taken from a cut on a separate lode contained 17 percent SnO_2.

John W. Greig, consulting engineer of Ivanhoe, Victoria, who has done exploration work on the property reports that a company is being established to test and develop the deposits.

Argentina Establishes New Resources Agency

A new agency, called the Northern Patagonia Corporation, has been established by the Argentine government to develop mineral and power resources in the provinces of Rio Negro, Nequen, and Chubut.

The corporation has been granted power to operate valuable iron ore deposits at Sierra Grande, in the Rio Negro province, and to work a variety of other deposits and potential deposits in two other areas in the region. One of these concessions extends from Puerto Madryn for a radius of approximately 100 miles; another will reach from San Antonio Oeste for a radius of 60 miles.

The Agency will also operate limestone quarries at Aguada de Cecilio, Valcheta, and Las Chapas; manganese deposits at Arroyo Verde; Alunite deposits at Camarones; and sodium chloride deposits at Salar de Gualicho. It will be authorized to regulate prospecting for water or minerals within its zones of operation.

In addition, development of hydroelectric power will be undertaken. The hydroelectric works at El Chocon, now under construction, will be turned over to the corporation upon completion.

Although the agency has been approved by the present administration and provincial governments involved, final ratification will be needed after the election of a new government to replace the present provisional one.

Israel Plans Increased Gypsum, Potash Production

Increased output of non-metallic minerals is planned by Israel in 1958, and expansion programs in the potash, gypsum, and cement industries are well underway.

Annual production of 120,000 tons of potash is expected in 1958, compared to 78,000 in 1957, and a capacity rate of 135,000 tons annually may be attained by the end of the year. Further increases in capacity will require expanded evaporation pan area and studies are being made to determine the feasibility of damming off a portion of the shallow south end of the Dead Sea to be converted into pan area. Included in the study will be a plan to pipe the carnalite slurry to new plant facilities which may be constructed by Dead Sea Works, Ltd. on the Mediterranean coast.

The Lime and Stone Production Company, Ltd. is expanding gypsum production facilities at Wadi Ramon to meet the increased requirements of the cement industry. A calcining plant is now under construction which will produce 60 tons of calcined gypsum per day. Kibbutz Gesher, Israel's second gypsum producer, is also increasing gypsum production from its operation in the Jordan Valley south of the Sea of Galilee.

Shimshon Cement, Ltd. and Nesher Portland Cement Company, Ltd. have undertaken expansion programs to increase annual capacity to 1,300,000 tons.

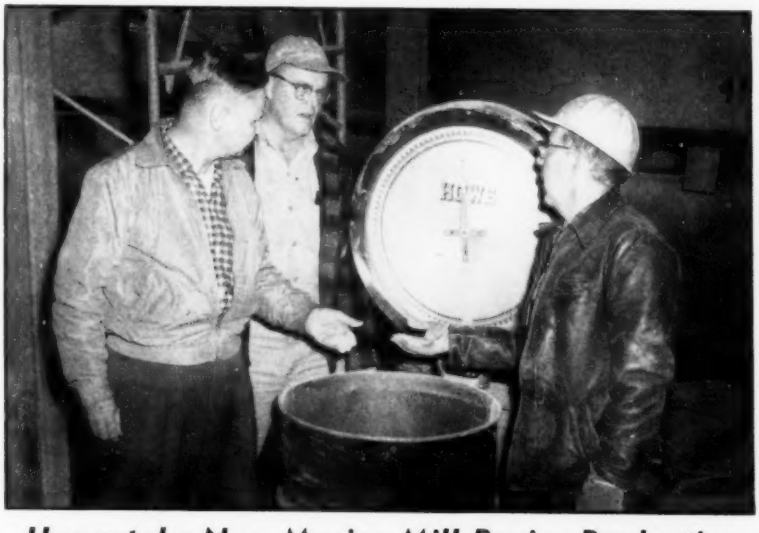
Several phosphate deposits have been discovered in the Negev region, and the Israel Geological Survey has begun an extensive drilling and exploration program in the area.

NORTH AMERICA

BRITISH COLUMBIA – *American Smelting and Refining Company* has been granted an extension on its exploration contract with *Bethlehem Copper Corporation*. ASARCO has spent $1,200,000 in examining the Highland Valley copper property of Bethlehem, and was to announce production plans by September 14, 1958 or return the property. Under this extension, ASARCO now has the right to give notice to Bethlehem by August 14, 1958 that it desires an additional year for further examination and exploration. The company will then be obliged to spend no less than $500,000 during the 12 months expiring September 14, 1959, on prospecting, exploration and development. A second 12-month extension may be granted on ASARCO's request which will obligate the firm to another $500,000 for work to September 14, 1960.

ALASKA–Jack Bullock of Lotzebue, a river boat operator in the interior of Alaska, has purchased the *Havenstrite Oil Company's* gold mine and properties at Candle, on Seward Peninsula. Included in the sale were two large dredges. Mr. Havenstrite acquired the Candle property in 1947 and reportedly had been mining an average of $200,000 in gold annually since then. Upon his death in March of this year, the property went into liquidation. Sale price has not been disclosed.

ONTARIO–Four uranium mills have gone into operation in the past two months in the Elliott Lake area: *Northspan Uranium Mines' Panel* mill, *Stanrock Uranium Mines*, *Stanleigh Uranium Mining Corporation*, and *Milliken Lake Uranium Mines*. All are 3,000-ton units.



Homestake-New Mexico Mill Begins Production

Construction of Homestake-New Mexico Partners' uranium processing mill near Grants, New Mexico has been completed and production has begun. In the picture above, the first barrel of yellow cake produced by the mill is weighed by (left to right) Langan Swent, Homestake-New Mexico general manager, Howard Jackson of Western Knapp Engineering Company, and Clyde Osborn, chief metallurgist for Homestake-New Mexico and one of the partners in the venture. The mill, constructed at a cost of approximately $5,325,000, has an initial capacity of 750 tons per day, and utilizes a carbonate leach type circuit which is applicable to both sandstone and limestone ores. Ore to be milled will be supplied by members of the partnership plus custom ore shipped by independent producers. The greatest tonnage of ore is currently mined from Rio de Ore Uranium Company's Dysart mine, and an increasing tonnage is being mined under Partnership supervision from Section 32 mine, owned by United Western Minerals Company, J. H. Whitney & Company, Weld & Company, San Jacinto Petroleum Corporation, and Homestake Mining Company. The mill was designed under the supervision of Clyde Osborn and constructed by Western Knapp Engineering Company. Homestake's second uranium mill, a 1,500-ton-per-day plant now under construction by Utah Construction Company for Homestake-Sapin Partners, is expected to be in operation in July.

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The 2,000-ton *Spanish American* mine plant of Northspan is scheduled for operation this month. In less than three years, about a dozen mines owned by eight companies have been brought into production. A total of 11 mills with a combined capacity of 34,000 tons of ore per day will now be in operation.

NEWFOUNDLAND—*Frobisher Ltd.* has sold its shares in *British Newfoundland Corporation* to *Suez Canal Company* for a rumored $1,250,000. Brinco has mineral exploration leases covering 50,000 square miles in Labrador and 10,000 square miles in Newfoundland. It also has long-term options on water and power rights in both areas. *British Newfoundland Exploration*, a subsidiary of Brinco, has driven an adit to intersect the ore body in its *Kitts* uranium prospect near Makkovik on the coast of Labrador.

ALASKA—According to company officials, *Fairbanks Mining Company* plans to spend $116,000 to develop the old *Lookout* lode mine on Emma Creek in the Ester district. They plan to drive a 6,000-foot exploration adit to block out the ore, and then to sink a 600-foot shaft at the 870-foot elevation. The company also will buy a ball mill, primary and secondary crushing and classification equipment. Hank Humphreys, George Haskins, and Harry C. Robinson organized the firm.

BRITISH COLUMBIA—*New Santiago Mines* expects to resume work this month on its gold property at Phillips Arm, 125 miles northwest of Vancouver. The firm plans to extend its 2,000-foot tunnel in the *Alexander* claim to reach some high-grade ore indicated on the surface of the adjoining *Enid* and *Julie* claims. In the New Denver area of British Columbia, the firm has suspended work in the *Bosun* mine until there is an improvement in base metal prices.

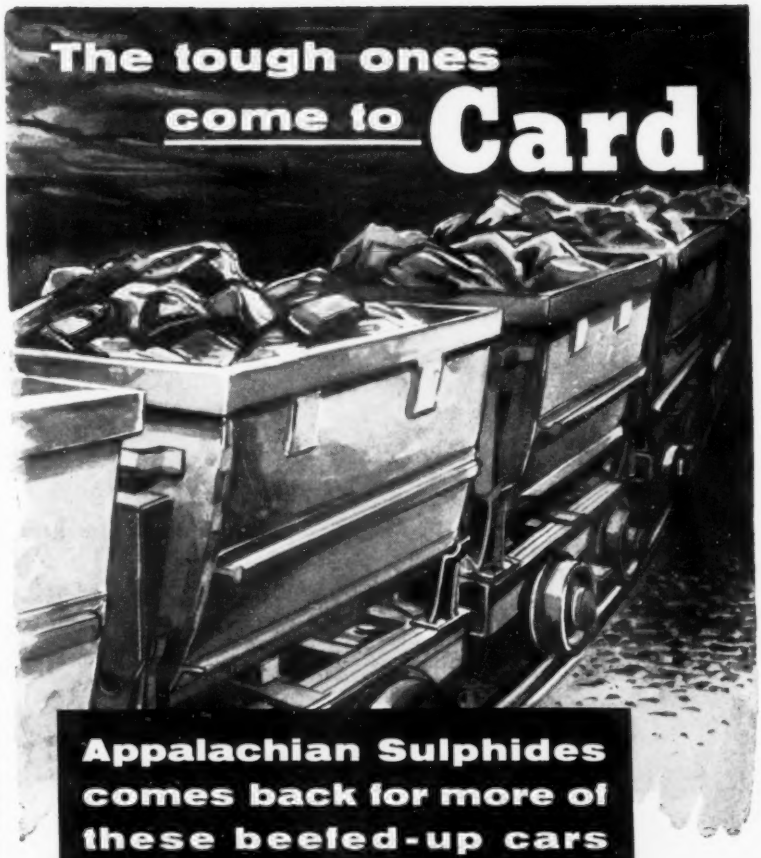
SASKATCHEWAN—*Duval Sulphur & Potash Company* spent about $376,000 on drilling of its properties in Saskatchewan last year. Results are now being evaluated pending further exploration or development work. The firm holds about 395,000 acres under Crown withdrawal and prospecting permits, and under rights obtained from freeholders.

ONTARIO—*Inland Steel Company* is reported to have formed a new subsidiary, *Inland Ore Company Inc.*, which is currently examining a low-grade iron ore deposit in western Ontario.

ALASKA—*Sunshine Mining Company* is awaiting a decision from the DMEA regarding assistance on a comprehensive diamond drill program the firm would like to undertake this summer. Sunshine has a lease on a mercury property and has already made detailed engineering and geological reconnaissance of the area.

BRITISH COLUMBIA—At the *Craigmont Mines Ltd.* copper-iron deposit near Merritt, *Canadian Exploration* has had excellent results in its diamond drill program. A wholly owned subsidiary of *Placer Development Ltd.*, Canadian Exploration has exercised its option to purchase 500,000 shares of Craigmont. The property involves 92 claims in the Nicola mining division.

ONTARIO—*Riobec Mines* has acquired an 880-acre iron property in the Michipicoten area, on the north shore of East Kabenung Lake in the Sault Ste. Marie Mining Division. The property is just a few miles northwest of *Algoma Steel Company's* producing *Helen* iron mine. Preliminary surface samples have assayed



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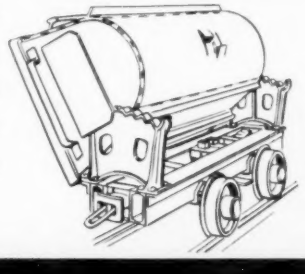

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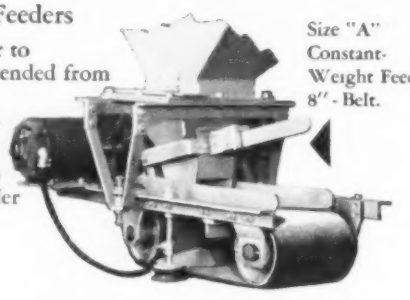

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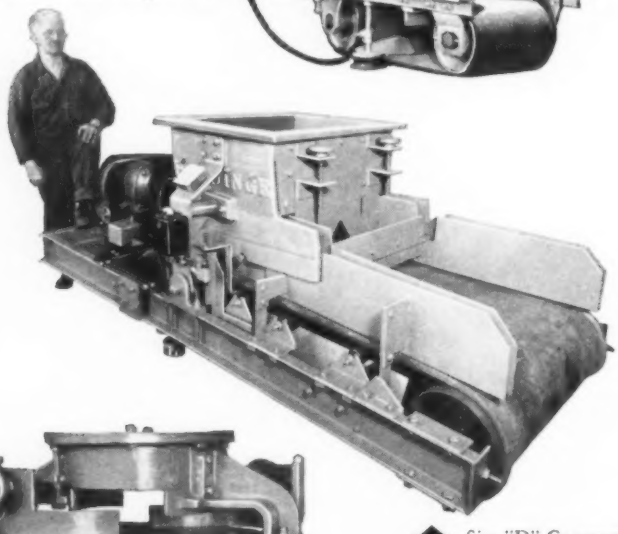

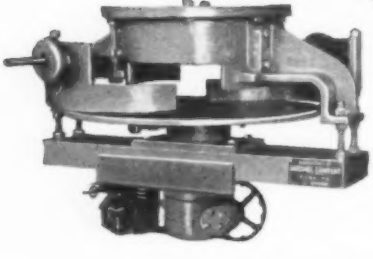

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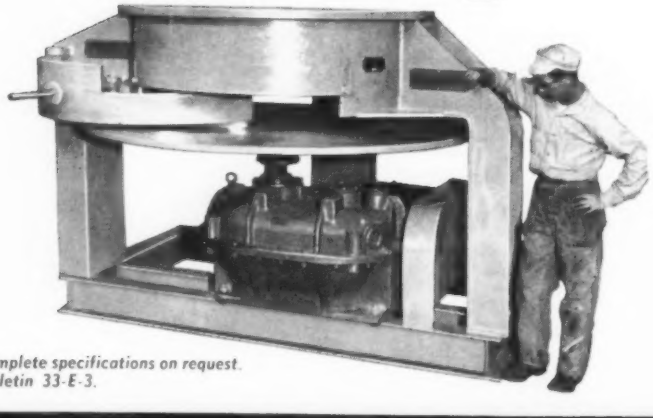

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37.20 percent and 65.60 percent iron. The firm also holds a nickel property in the Thompson-Moak Lake areas of Manitoba where an electro-magnetic survey has just been completed.

GREECE—An extensive geological and diamond drilling program undertaken by *Kennecott Copper Corporation* has revealed what is believed to be the largest asbestos deposit in Europe. A small pilot plant has been constructed at the property, and samples of the product are currently being shipped to consumers of raw asbestos for testing.

SWITZERLAND—Discovery of a rich deposit of uranium has been reported in the Swiss Alps. The deposit is located in a shaft forming part of the *Grande Dixence* hydro-electric project in the Valais.

NORWAY—*Hannoman A/S* has undertaken a geological survey of an iron ore deposit located near Erikstad, northern Norway. The ore is believed to contain 55 percent iron.

POLAND—Important progress has been made in the development of copper deposits in the regions of Boleslawow and Zlotoryja, and Wroclaw and Zielona Goro Voivodships. Expansion of the *Konrad* mine is underway and when completed production is expected to reach more than 1,000,000 tons of copper ore yearly. The *Nowy Kosoiol* copper mine is also being expanded and production of 400,000 tons per year is predicted by 1960. Shaft sinking has begun at the *Lubichow* mine with production scheduled to begin in 1960. In the region of Sieroszowice and Lubin, ore deposits with an average copper content of 1.4 percent, as well as indications of zinc, lead, silver, vanadium, cobalt, and molybdenum, have been discovered. Further exploration in this area is planned.

ITALY—Iron and steel production increased more than 10 percent in 1957 as compared with 1956 production, according to *ASSIDER*, the *Italian Steel Manufacturers Federation*. Steel production in 1957 totalled 6,787,000 tons compared to 5,907,630 in 1956; pig iron production was 2,071,910 tons in 1957, 1,873,426 tons in 1956; and 4,996,000 tons of rolled products were produced in 1957 compared with 4,436,649 in 1956. The production of alloys, 120,146 tons in 1956, was set at 132,892 in 1957.

GREECE—Two Belgian firms, *Ets. Bazin* and *E. Goldstein*, of Brussels plan to invest $140,000 in developing a manganese ore deposit in the Phthiotisphokis area and prospecting for additional deposits. A jointly owned Greek company will be established to carry out the project.

NORWAY—*Folldal Verk A/S* has reported discovery of an iron ore deposit at Tverfjell in central Norway. Extensive geological and geophysical exploration is also underway in northern Norway.

AUSTRIA—The *International Atomic Energy Agency*, with headquarters in Vienna, reports nine countries have agreed to furnish fissionable materials, source materials, radioactive isotopes, and special materials for reactors for atomic

energy programs sponsored by the Agency. Participating countries are Canada, Ceylon, India, Norway, Portugal, Union of South Africa, Russia, United Kingdom, and the United States. In addition to offering nuclear materials, contributions have been made to the $250,000 fellowships fund and several countries have made available fellowships and training facilities. The IAWA is affiliated with the United Nations.

RUSSIA—New iron deposits large enough to supply a large iron and steel works for many decades have been reported in Siberia, east of Lake Baikal. Fluxes, coal, and other raw materials necessary for iron smelting have also been found in the vicinity. In addition, discoveries of non-ferrous metals, including copper, have been reported by Soviet geologists in the Trans-Baikal area.

SPAIN—The German firm, *Stolberger Zink*, has been granted permission to invest up to 45 percent of the total capital of two Spanish bismuth-producing ventures, *Concesiones Mineras* S. A. and *Cia. Metalurgica del Sur* S. A.

BELGIUM—*Societe des Mines et Fonderies de Zinc de la Vieille-Montagne* has reportedly reduced production of its horizontal retort zinc plants by 20 percent, and further reduction is contemplated.

ITALY—A 1,200-ton-per-day iron blast furnace has been delivered to the *Ilva Company's* plant at Bagnoli. Equipment for another 1,000-ton-per-day blast furnace to be installed at the company's Piombine plant is scheduled for delivery by the end of the year. The equipment was designed and built by the *Koppers Company* of Pittsburgh, Pennsylvania.

LATIN AMERICA

BRAZIL—*United States Steel Corporation* began making its first shipments of manganese ore from its *Urucum* deposits in the Corumba district of Mato Grosso state in 1957.

CHILE—The *Cia. Salitrera Anglo Lautaro* has recently been given a loan by the Export-Import Bank to mechanize its loading facilities at the port of Tocopilla. This project will probably be completed later this year.

PERU—*Cerro de Pasco Corporation* expects its 1958 production of copper, lead, and zinc at La Oroya smelting and refining center to be about 7½ percent less than in 1957. The indicated reduction in total metal output, equivalent to a tonnage cutback from 1957 levels of approximately 1,050 tons monthly, represents a further substantial reduction below the approximate 300 tons per month copper curtailment announced by the firm in December 1957. The projected decline is a further step to bring supply more in line with present and prospective short-term future demand.

MEXICO—*Greene Cananea Copper Company*, a subsidiary of *The Anaconda Company*, has located a large tonnage of disseminated copper mineralization which appears to have the size and grade of a major porphyry copper deposit. The find has been made in the La Colorado ore body on the company's property in Cananea, Sonora. Drilling is insufficient for an ore reserve estimate. Further development will depend upon whether the Mexican government affords equitable treatment to the copper mining industry in Mexico, say company officials.

PERU—With the aid of a $10,000,000 credit from the Export-Import Bank, *Marcona Mining Company* will undertake a $25,500,000 construction and expansion program on its iron ore property near the Port of San Juan. New facilities will be added to enable Marcona to upgrade its concentrates.

MEXICO—*E. I. du Pont de Nemours & Company* reportedly has been buying several fluorspar mining properties at La Paila and Muzquiz in the state of Coahuila. The firm is said to be interested in developing these properties as acid-grade producers and consideration is being given to installation of a flotation mill.

BOLIVIA—*Corporacion Minera de Bolivia* has released production figures for February 1958. Here is a comparison with the same month in 1957. Tin 1,155 metric tons in 1958, 1,872 in 1957; tungsten 43 metric tons in 1958, 99 in 1957; zinc 690, compared with 1,392 in 1957; silver 12, compared with 9; lead 587, compared with 605; copper 156, compared with 289; bismuth 4, compared with 1 metric ton in 1957. Gold output in that month of 1958 was 359 grams, compared with 641 grams in 1957.

New Vessel Hauls Heavy Machinery to Remote Mines with No Port Facilities

A new type of ocean-going vessel has been developed by the West India Shipping Company, Inc. to carry shipments of heavy machinery and materials to mining operations in the Caribbean Sea area where delivery was considered impossible a few years ago. The heaviest shipment transported to date was a Manitowoc Model 4500 crane, weighing 196 tons, which was shipped intact from Miami, Florida to Moa Bay, Cuba and driven off under its own power onto a dirt-fill dock. The vessel, which utilizes the principle of an LST landing craft, is capable of delivering cargoes weighing up to 400 tons directly onto beaches or temporary landings at foreign mines. It is equipped with detachable bulwarks and four ballast tanks on each side of the ship. All machinery is loaded and unloaded under its own power, or pulled off, so that no large lifting equipment is needed. For the Moa Bay shipment, the crane was dismantled at Manitowoc's factory in Wisconsin and shipped by railroad car to Miami, where it was reassembled to save loading and unloading time. To load the machinery it was necessary to first secure the ship to the dock with two D-8 crawler tractors. A double deck of timbers was laid on the vessel's deck, the ballast tanks were filled to settle the ship until her deck was level with the dock, and the crane was slowly inched onto the deck with special precautions taken to keep the center of gravity balanced (see the photo on the left). The picture at the right shows the crane enroute, loaded with the cab parallel to the sides of the ship and the boom lashed to the bow. The crane was delivered to Cuban American Nickel Company, a subsidiary of Freeport Sulphur Company, in Moa Bay Cuba, where it will be used to construct a mill and develop a strip mining operation. Unloading procedure was similar to the loading method, but in reverse. Under ordinary conditions it would have been necessary to ship the crane to Santiago, Cuba, 120 miles from the mine, which is the nearest deep-water port with sufficiently large handling equipment to facilitate lifting heavy machinery from a ship onto shore; a ship with powerful lifting equipment on it would have too deep a draft for the Moa Bay dock.

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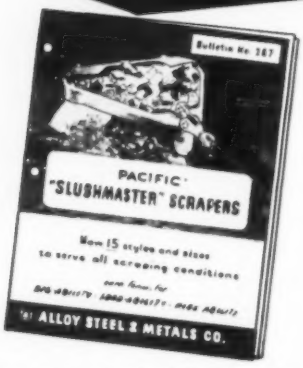

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INTERNATIONAL

CHILE—Two Japanese mining firms are reported to be buying the mining rights to a medium-sized copper mine in northern Chile. This would be the first time that mining rights have been purchased outright by Japanese enterprises. Until now the Japanese have participated in developments through investment in joint firms or through technical assistance. The two Japanese firms are *Nippon Mining Corporation* and *Dai-Ichi Bussan*. They were purchasing the rights from Bartolome Marre, owner of the mine. A new firm is to be organized which will be owned jointly by the two Japanese companies. The copper mine is an open-pit operation, with monthly production estimated at 3,600 tons of crude ore or 110 tons of pure copper. Total development costs are expected to be about $1,000,000. The property is less than 10 miles east of the port of Antofagasta, and precipitates would be shipped through this port to Japan.

MEXICO—*Kennecott Copper Corporation* has established a new exploration subsidiary in Mexico called *Compania Minera Kennex, S.A.*

PERU—The $200,000,000 investment in the *Southern Peru Copper Corporation's Toquepala* copper project is already running over that figure. Latest estimate indicates that an additional $30,000,000 will be needed to bring the project to production. Extra financing will probably be required in 1959 in addition to that originally committed by the stockholders and the $100,000,000 of the *Export-Import Bank*. Completion date is set for the first half of 1960. So far, offices, repair shops, and accessory facilities at the mine, as well as the dock at the Port of Ilo, have been finished. Warehouses, housing, and townsite are almost completed, and the largest part of the rail line from Ilo to the mill has been laid.

ASIA

TURKEY—Recent examination of an idle copper mine, the *Everek*, near Bayburt in northeastern Turkey, revealed a 400,000-ton partially oxidized dump assaying 2.56 percent Cu. Encouraged by this information, the *Bayindirli Ticaret ve Maadin Ltd.* has prepared an extensive drilling and exploration program for the main ore body in 1958.

CHINA—The Chinese government has made a barter agreement with a Japanese steel mission. In exchange for $280,000,000 worth of Chinese coal and minerals, China reportedly will receive the same sum in Japanese steel over a five-year period. The minerals concerned probably are iron, ore, manganese clinker, and tin.

EGYPT—The *Nuclear Survey Department* of the *Egyptian Atomic Energy Commission* has reported the discovery of uranium deposits in the desert areas of the country. The surveys are said to have been conducted with the aid of equipment from the U.S.S.R. Samples have been sent to atomic plants of Russia, India, and Yugoslavia, where they will be analyzed.

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gram to meet the restrictions imposed upon Malayan tin production by the International Tin Council. Pacific Tin and the other dredging companies in Malaya have been restricted through June 30, 1958 to a rate amounting to little more than 50 percent of the average production of each operating dredge. This is expected to have an immediate effect on the earnings of the company.

THAILAND—The Thai cabinet asked the International Tin Council for an increase in the country's quota under the International Tin Production restriction plan for the second quarter. A four-man commission recently investigated the conditions in southern Thailand where tin mines reportedly had been hard hit by the output restrictions. The Council turned down the request.

PAKISTAN—Uranium deposits of the "finest quality" have been discovered in the Hazara district of the Northwest Frontier Province, according to the chairman of the *Pakistan Atomic Energy Commission*, Dr. Nazir Ahmed. Surveys of the area are now underway.

INDIA—The first shipment of iron ore was made from the port of Karwar on the Arabian Sea in February when 11,000 tons were loaded by the Turkish freighter "S. S. Haran." The vessel reportedly was destined for Czechoslovakia. Mysore state has a 200-mile coastline with 22 ports, two of which, Mangalore and Karwar, are intermediate ports. This development has now made it possible to export the rich hematite iron ore from Hospet area of Bellary district. Mysore state has constituted a *Mineral Development Board* to follow the central government's policy of reserving "scheduled minerals" for state development. It has been planned to increase the production of iron and manganese ores annually to 5,000,000 tons, or ten times present production. Bhilai Steel Works has asked the board to supply 60,000 tons of low-grade manganese ores.

JAPAN—The Japanese have stopped all imports of manganese and iron ore from Goa (Portuguese India). They have decided to help India by contributing $8,000,000 to develop the high-grade iron ore deposits of Rourkela in Orissa state. Necessary extension of railway and port facilities would also be developed for larger exports to Japan. The transportation charges from Orissa would be cheaper, it is reported.

KOREA—The *Samsong Mining Company* submitted a plan to the Mining Bureau of the *Ministry of Commerce & Industry* for the refining of lead ore this year. According to the plan, a 30-ton furnace, now idle, would be used to process over 700 tons of lead ore monthly. Officials of the Bureau say that the plan requires that funds be raised for the operation of the company. Also, only 1,843,791 tons of lead ore were produced in 1957.

TURKEY—An Israeli finance group under the leadership of Edmond Levy of Tel Aviv, has acquired an 80 percent interest in a lead-zinc prospect in the Zamanti district, 100 miles east of Kayseri in Central Anatolia. The district has only been recently discovered. Two active zinc mines are producing oxidized ore. Several promising lead-zinc bodies have been opened near Aysepinar, which will be the center of the Israeli mining group's activities.

KOREA—The *Ministry of Commerce's Mining Bureau* has drafted a program for

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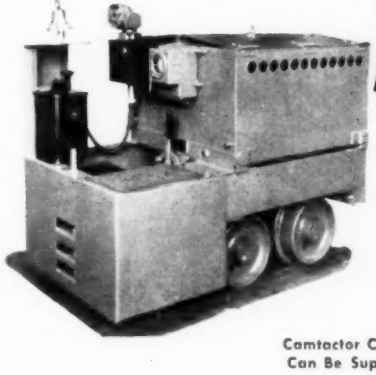

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mine development with the aid of $8,760,000 in 1959 ICA funds. Seven projects are to be undertaken with the money, as follows: sulphuric acid plant (Changhang refinery), $950,000; training of mining technicians, $910,000; development of five types of metal mines, including nickel, $2,600,000; development of graphite mines, $600,000; development of alluvial gold mines, $2,400,000; development of rare mineral mines $500,000; and drilling expenses, $800,000.

PAKISTAN—The East Pakistan Cabinet is reported to be planning to set up a *Mining Development Corporation* for the development of mineral resources in the province. A similar step has already been taken in West Pakistan. (Under the constitution of Pakistan, the provincial government has the responsibility for mineral development and that is why the East Pakistan government must set up a separate corporation.) Large mineral occurrences have been noted in the eastern sector of late, particularly low-grade iron ore in the Mymensingh, Tippera, and Sylhet districts. It is understood that the government of Pakistan will provide all necessary geological services to East Pakistan in connection with the exploration work, and the Geological Survey of Pakistan will appoint an adequate staff for this purpose.

FEDERATION OF RHODESIA & NYASALAND—*M.T.D. (Mangula) Ltd.* has reported that its Molly Section copper ore reserves over the past year were increased considerably and that a further increase can be expected when the lower levels are more fully developed. In the East ore body, drilling has disclosed extension of mineralization south of the limit reached by development to date.

GHANA—*Ariston Gold Mines Ltd.* reports that its No. 2 ore body is increasing in size with depth, and latest development suggests that on the No. 26 level, the lowest being developed to date, the reef appears to be flattening out. This is an important and encouraging factor for the mine's future deep-level development program.

UNION OF SOUTH AFRICA—The *South African Iron and Steel Industrial Corporation* is extending its expansion program by an additional 900,000 tons to 2,350,000 tons of ingot a year at its two existing plants over the next few years. Consequently, increased output of iron ore, (mainly from the *Sishen* deposits in the Northwestern Cape), as well as coal and coke, limestone, dolomite, fluorspar, etc. can be expected. Other producers of iron ore will also probably increase production for export and domestic sales.

BELGIAN CONGO—The government has now adopted and is sponsoring the project for construction of a huge hydroelectric plant at Inga. The complete plan would involve an investment of about $3,000,000,000 which would come from many sources. It would be the largest project of its kind ever undertaken and a first phase enabling production of 1,500,000-kw could be completed within six years. In its final stage, output would be about 25,000,000 kw.

MOROCCO—A dispute over mining rights in the border area between Morocco and Algeria has arisen with the incorporation of the French company *Societe des Mines du Jebel Guettara*. The latter was awarded a concession by the French authorities for the development of a manganese deposit in the Jebel Guettara, 60 miles west of Beni Abbes in the Oran Department of Algeria and 165 miles east of Zagora in Morocco. These hills are located in a place where there is no fixed frontier between Morocco and Algeria, and the Moroccan authorities claim the property lies in Morocco while the French claim it is in Algeria.

GHANA—Ore reserves at the end of the last financial year for *Bibiani (1927) Ltd.* were estimated at 1,335,539 tons with an average gold content of 5.04 dwt. per ton, a decrease of 56,467 tons and 0.45 dwts. compared with the year previously. These reserves are equivalent to just over a three-year mill supply, at the increased crushing rate of 35,000 tons per month, yielding approximately 4 dwts. per ton. The future of the mine still depends on the discovery of major ore bodies because the intersections made last year at the south end of the mine on the No. 19 and No. 20 levels, though promising, are no indication that a major ore body is developing in this area.

BELGIAN CONGO—*Union Minière du Haut Katanga* has decided to postpone construction of the second half of its electrolytic plant at Luilu until 1962. It had originally been planned to start the second section in 1960. It is also possible the building of the fifth power station in

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Katanga will be postponed because it has been found that the water reservoir for the Delcommune power station has a 35 percent greater capacity than the 1920 surveys indicated.

FEDERATION OF RHODESIA & NYASALAND—*Rand Mines* has taken an option on extensive lithium deposits at Bikita near Fort Victoria, which are owned by Geroge Nolan. Diamond drilling is under way.

SOUTH WEST AFRICA—The famous *Abenab West* lead and vanadium mine has been closed because of the decline in prices. The mine is owned by *South West Africa Company* which, in turn, now is controlled by *Consolidated Gold Fields, Anglo-American Corporation*, and *British South Africa Company* after intensive bidding for its management last year.

OCEANIA

QUEENSLAND—*Commonwealth Aluminum Corporation Pty. Ltd.* has taken an option over mining leases held by *Blair Athol Coal and Timber Co. Ltd.* and *Blair Athol Open Cut Collieries Ltd.* Over the next five years, Comalco will investigate the possibility of establishing on the central Queensland coast an aluminum smelter using electric power produced from Blair Athol coal. After the signing of the agreement with the Queensland government last December, the company was asked to include Blair Athol and other Queensland coals in its investigations. The first objective is to produce alumina in Queensland and later smelt it into metal in Australian territory if economic factors are favorable. Several Queensland power sources will be examined as well as New Guinea potential.

REPUBLIC OF THE PHILIPPINES—Operations of the *Atlas Fertilizer Corporation* at Sangi on Cebu Island are getting under way. The firm is a subsidiary of Atlas Consolidated Mining and Development Corporation which is producing copper from the *Toledo* copper mine and flotation plant on Cebu. The fertilizer project will use the pyrite from the copper floation plant to produce SO_2. From this, sulphuric acid will be made which will be used to acidulize the phosphate rock to make a superphosphate.

SOUTH AUSTRALIA—An agreement in principle has been made by *The Broken Hill Proprietary Company Ltd.* and the State Government under which the former will build a £30,000,000 steel industry at Whyalla on Spencer Gulf. A separation plant is expected to be located at Iron Knob, 40 miles away, for concentrating iron ore from jaspelite. Building will start in 1960. It is estimated that initially the proposed steel plant will be about one-third the size of the present one at Newcastle, New South Wales, and will produce about 300,000 tons of steel per year.

NEW GUINEA—The *Department of Lands, Surveys, and Mines* at Port Moresby, Papua, reports that gold production in 1957 was as follows: Papua 471 ounces; New Guinea 68,564 ounces. Prospects are expected to be about the same in 1958, although *Bulolo Gold Dredging Ltd.* reportedly expects a slight decline in this year's output. The company is moving its No. 5 dredge and will cover some lowgrade areas in order to reach reserves formerly allocated to No. 7 dredge.

REPUBLIC OF THE PHILIPPINES—Prospectors are reported to have found large deposits of copper near Guihulngan, the largest town in Negros Oriental.

WESTERN AUSTRALIA—*Western Mining Corporation Ltd.* has obtained a reservation of about 2,000 square miles in the west Kimberley district. The area covers an extensive copper mineralization which outcrops in various places over 30 miles. The location is about 60 miles

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from Derby, south of Collier Bay. For some time the company has been seeking diversification of its gold mining interests. During the uranium boom, the firm was interested in several properties but did not proceed with development of any.

REPUBLIC OF THE PHILIPPINES—*Liberty Chromite Mining Corporation* has been making geological surveys and doing some diamond drilling on several manganese deposits in Palawan. The firm hopes to start producing high-grade manganese ore from these deposits by the middle of this year. Meanwhile, shipments of refractory and metallurgical chromite ore are being made from properties on Palawan, Samar, and Zambales.

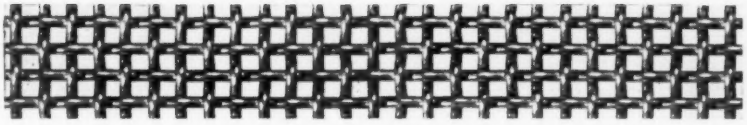
NORTHERN TERRITORY — The Commonwealth *Bureau of Mineral Resources*, with the approval of the interests involved in the Maranboy Tinfields (*United Uranium N.L., Loloma Fiji Gold Mines*, and *King Island Scheelite N.L.*), will carry out a diamond drilling program in the area to help determine whether the field can be developed for large-scale production of tin. The arrangement is that if the companies reach the stage of producing tin concentrates, the Commonwealth will be reimbursed for the cost of drilling.

INDONESIA—The Indonesian government has assumed full control of the *Billiton* tin mines as of March 1. There had been joint management of the operation by Dutch and Indonesian representatives. Production is to be carried on as usual.

WESTERN AUSTRALIA—*Westralian Oil Ltd.* hopes to start producing ilmenite this fall from its property at Yoganup. A concentration plant is to be built there, and concentrates will be separated at Capel. Proven reserves at Yoganup are 1,300,000 tons, and at Capel 3,100,000 tons.

REPUBLIC OF THE PHILIPPINES—The Japanese Ministry of Trade and Industry has assured Philippine iron ore producers that Japan can absorb all the iron ore the Philippines can produce. The country's needs are approximately 20,000,000 metric tons annually, according to these officials. There has been some concern about the Japanese market because of recent Japanese negotiations with India for the joint development of Indian iron ore resources.

NORTHERN TERRITORY — *United Uranium N.L.* expects to begin production of uranium oxide at the converted plant of *Northern Hercules N.L.* at Pine Creek by the end of the year. A representative of the *United Kingdom Atomic Energy Authority* has visited the South Alligator River area and investigated the company's ore reserves. Negotiations for a long-term contract for the sale of uranium oxide are expected to be finalized soon. 20,000 tons of ore from the *El Sharana* mine will be carted to the plant at Pine Creek during the coming dry season. The *South Australian Department of Mines* has completed laboratory research and started its solvent extraction pilot plant for a two weeks' run on a representative parcel of El Sharana ore. The milling characteristics, leaching, and uranium recovery are up to expectations. *South Alligator Uranium N.L.* expects to start its ore production during the next dry season, and has held negotiations with the U.K. Atomic Energy Authority concerning a future sale price. Treatment of the ore is to be undertaken in United Uranium's mill.



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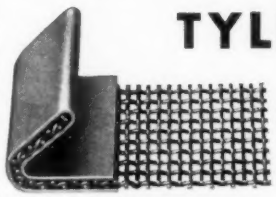

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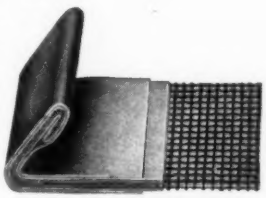

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U.S.A. Metal & Mineral Prices

April 22, 1958

METALS

COPPER: **Electrolytic.** Delivered F.o.b. cars, Valley basis ..... 25.00¢
Lake. Delivered, destinations, U.S.A. ..... 25.00¢
Foreign Copper, Valley basis ..... 25.00¢
Custom ..... 24.50¢
LEAD: **Common Grade.** New York ..... 12.00¢
Tri-State Concentrate, 80% lead $141.72
ZINC: **Prime Western:** F.o.b. E. St. Louis ..... 10.00¢
Prime Western: Delivered, New York ..... 10.50¢
Tri-State Concentrate, 60% zinc, per ton $56.00
ALUMINUM: **Primary 30 Pound Ingots (99% plus).** ..... 26.10¢
ANTIMONY: **Lone Star Brand. F.o.b. Laredo, in bulk** ..... 29.50¢
BISMUTH: (In ton lots) price per pound $1.55
CADMIUM: **Sticks and bars.** 1 to 5 ton lots (Price per pound) $1.70
COBALT: **97.99%,** keg of 550 pounds (Price per pound) $2.00
COLUMBIUM: **Powder** ..... Nom., per pound $120.00
GERMANIUM: **Germanium:** dioxide, high purity, gram ... 24.00¢-30.00¢
LITHIUM: **98%** (per pound) ..... $11.00-$14.00
MAGNESIUM: **Ingots (98.8%)** F.o.b. Valasco, Texas, per pound 36.00¢
MERCURY: **Flasks.** Small lots, New York ..... $233.00-$237.00
NICKEL: **"F" Ingots (5 pounds).** F.o.b. Port Colbourne, Ontario 75.50¢
PLUTONIUM: To July 1, 1962 AEC will pay $30.00 to $40.00 per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram $30.00
SELENIUM: **99.5%,** per pound $7.50
THORIUM: per kilogram $43.00
TIN: **Grade A. Brands.** New York (per pound) Prompt delivery ... 92.50¢
TITANIUM: **99.3%** ... Grade "A" Sponge (Price per pound) $1.65-$2.05
URANIUM: **Nominal,** per kilogram $40.00
U-235: **Nominal,** per pound $7,725
GOLD: **United States Treasury Price** ..... $35.00 per ounce
SILVER: **Newly mined domestic.** U.S. Treasury price per ounce 90.5¢
Foreign Handy Harmon ..... 88⅝¢
PLATINUM: Per Ounce ..... $72.00-$75.00
ZIRCONIUM: **Sponge, Per Pound,** Reactor Grade $7.50

ORES AND CONCENTRATES

BERYLLIUM ORE: **10 to 12% BeO.** F.o.b. mine, Colorado $46.00 per unit Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at $400.00 per short ton or by assaying at: 8.0 to 8.9% BeO, $40 per unit; 9.0 to 9.9%, $45; over 10.0%, $50.
CHROME ORE: F.o.b. railroad cars eastern seaports. Dry long tons
African (Rhodesian). 48% CR_2O_3. 3 to 1 Ratio ..... $46.00-$47.00
African (Transvaal). 48% Cr_2O_3. No ratio ..... $36.00-$37.00
Turkish, 48% Cr_2O_3. 3 to 1 chrome-iron ratio ..... Nominal $53.00
U.S. Government ore purchase depot Grants Pass, Oregon, Base price, lumpy ore, $115.00; fines and concentrates $110.00 for 48% Cr_2O_3 and a 3 to 1 chromium-iron ratio. Premiums for higher grade ore and for a ratio up to 3.5 to 1. Penalties for grades down to 42% Cr_2O_3.
COLUMBIUM-TANTALUM ORE: At United States small lot beryl purchase depots. $3.40 per pound contained combined pentoxides in 50% ore. Includes 100% bonus. (Government stopped buying temporarily May 12, 1957) ..... Per Pound Pentoxide ..... $1.15-$1.35
IRON ORE: **Lake Superior. Per gross ton Lower Lake Ports**
Mesabi, Non Bessemer, 51.5% Fe $11.45
Mesabi, Bessemer, 51.5% Fe $11.60
Old Range Non Bessemer $11.70
Old Range Bessemer $11.85
Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit.. 26.00¢
MANGANESE ORE: **Metallurgical grade.** 48 to 50% Mn. Long ton unit ..... $1.35-$1.40
Metallurgical grade. 46 to 48% Mn. Long ton unit ..... $1.30-$1.35
Metallurgical grade. 44 to 46% Mn. Long ton unit ..... $1.25-$1.30
Domestic U.S. Government purchasing depots: Butte, Mont.; (black and pink ores) base price of $4.87 per long dry ton of 18% manganese ore. Phillipsburg, Mont.; base $6.43 per long ton of 15% manganese ore. Small lot program f.o.b. railroad cars, minimum 40%. Base (48%) $2.30 per unit with premiums and penalties.
MOLYBDENITE CONCENTRATE: **90% MoS_2 F.o.b.** Climax, Colorado. Per pound Mo, plus container cost $1.18
TUNGSTEN CONCENTRATE: **Domestic.** 60% WO_3 Per short ton unit $14.00
Foreign. 65% WO_3 Per short ton unit (Scheelite) .. Nominal $15.00
Foreign: South American, Spanish, Portuguese ... Nominal $12.50
URANIUM ORE: F.o.b. purchase depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is $1.50 per pound of U_3O_8 in ore assaying 0.10 percent. For each additional 0.01 add 20¢. Subject to development allowance, premiums, penalties where applicable.

NON-METALLIC MINERALS

BENTONITE: **Minus-200-mesh.** F.o.b. Wyoming. Per ton, carload lots $12.50
Oil Well grade. Packed in 100 pound paper bags $14.00
BORON: Technical grade ..... F.o.b. Boron, California. Per ton $47.50
FLUORSPAR: **Metallurgical grade.** 72.5 % effective CaF_2 content per short ton F.o.b. Illinois-Kentucky mines ..... $38.00-$40.00
Mexican. 70% F.o.b. border ..... $26.00-$27.00
Acid Grade. 97% CaF_2, Bulk, F.o.b. mine ..... $48.00-$52.00
Government buying F.o.b. producer's shipping point: 60% Illinois-Kentucky, $34.50 per ton, others $28.50; 70% Ill.-Ken. $38.50, others $32.50.
PERLITE: **Crude:** F.o.b. mine per short ton ..... $3.00 to $5.00
Plaster grades. Crushed and sized. F.o.b. plants .... $7.00 to $9.00
SULPHUR: Long ton, F.o.b. Hoskins Mound, Texas $25.00
Export ..... $24.00-$25.00

LONDON METAL AND MINERAL PRICES

April 22, 1958

			Per Long Ton	USA Equivalent cents per pound[1]
COPPER:	Electrolytic spot	£173	15s Od	21.72¢
LEAD:	Refined 99%	£ 73	0s Od	9.12¢
ZINC:	Virgin, 98%	£ 62	10s Od	7.81¢
ALUMINUM:	Ingot, 95.5%	£180	0s Od	22.50¢
ANTIMONY:	Regulus, 99.6%	£197	10s Od	24.69¢
TIN:	Standard, 99.75% ...	£731	0s Od	91.38¢
TUNGSTEN:	Long ton unit	87s		$12.18

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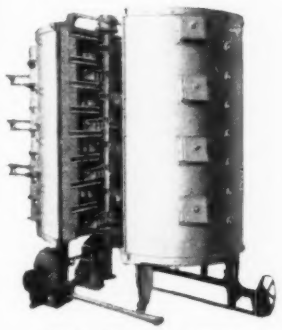

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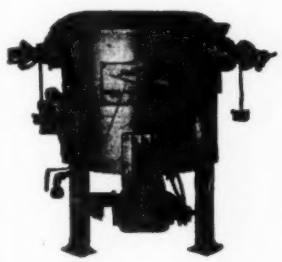

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1—37 HP Single Drum
1—40 HP Vulcan #22C
2—50 HP H & B
1—50 HP Fairbanks-Morse
1—50 HP Vulcan
1—50 HP Box
1—75 HP Vulcan
2—100 HP Box
1—112 HP Vulcan
2—125 HP Ottumwa
2—150 HP Vulcan
2—200 HP Ottumwa
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1—75 HP with Post Brakes
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1—150-200 HP Ottumwa
1—150 HP Jackson

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1—Ingersoll-Rand Model DU
2—Ingersoll-Rand Model D6U
4—Ingersoll-Rand Model IH
1—Sullivan Model E-111
9—Ingersoll-Rand Model EUA
1—Ingersoll-Rand Model 10-H
8—Gardner-Denver Model HK
2—Joy "Turbinair" Model F-113
1—Sullivan Model L-111
2—Ingersoll-Rand Model 10HR
1—Sullivan Model HA 3
3—Ingersoll-Rand Model H4

ELECTRIC TUGGERS AND SLUSHERS

4—5 HP Sullivan, 2 drum slushers
1—5 HP Sullivan tugger
2—7½ HP Sullivan tuggers
1—10 HP Sullivan 3 drum slusher
2—15 HP Ingersoll-Rand size 15NN-IG, 2 drum slushers
2—20 HP Ingersoll-Rand size 20NM2C, 2 drum slushers
1—50 HP Sullivan Model CF-211 double drum slusher
1—10 HP Ingersoll-Rand 3 drum, model 10MNM-2G

AIR SLUSHERS

4—Ingersoll-Rand Model A5NNOH
4—Joy Model FF211
1—Ingersol-Rand Model HNN-1J

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17—Eimco 12B, 18" ga.
8—Eimco 21, 18" & 24" ga.
3—Gardner-Denver Model 9, 18" ga.
1—Joy HL3, 18" ga.
1—Joy HL20, 24" ga.

APRON FEEDERS

1—24" x 20' Link-Belt
1—42" x 18' Stephens-Adamson

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14—Ingersoll-Rand Model R48 Stopers
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7—Gardner-Denver Model FL48-4 Air Leg Drills
3—Thor Model 390 Air Leg Drills
6—Atlas Copco Model BBL22 Jack Drills
6—Ingersoll-Rand Model DA35 Drifters

GYRATORY CRUSHERS

1—2' Symons Cone
1—12" Traylor Type T
1—2' 4" Traylor Type TY
1—3' Traylor Type TY

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3—1" Denver
1—1½" Kimball-Krogh
1—1½" Vacseal
1—2" Denver
2—2" A.S.H. Hydroseal
1—2" Vacseal
4—2" Wilfley
1—3" A.S.H. Hydroseal
2—3" Wilfley
2—4" A.S.H. Hydroseal
1—4" Wilfley
1—6" Amsco

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1—3' x 6' Symons Single Deck
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1—6' x 4' Hardinge Conical Ball Mill
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1—7' x 5' Allis-Chalmers Ball Mill
1—8' x 22' Hardinge Conical Ball Mill
1—3' x 8' Morse New Rod Mill
1—4' x 10' Hardinge Rod Mill
2—5' x 10' Traylor Rod Mills

JAW CRUSHERS

6—2¼" x 3½" New Morse Lab Crushers
6—4" x 6" New Morse Lab Crushers
1—6½" x 7" Hendy Jaw Crusher
1—8" x 15" Wheeling Jaw Crusher
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5—Deister Overstrom Diagonal Deck Left Hand

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6—1½ Ton Mancha "Trammers"
1—1½ Ton General Electric Battery Locomotive
3—3½-4 Ton Mancha "Titan A" Battery Locomotives
1—4 Ton Westinghouse Battery Locomotive
1—4 Ton General Electric Trolley Locomotive
1—6 Ton Goodman Trolley Locomotive
1—6 Ton Jeffrey Trolley Locomotive
2—6 Ton General Electric Battery Locomotives
2—7 Ton General Electric Battery Locomotives
1—7 Ton Jeffrey Trolley Locomotive
1—7 Ton Atlas Battery Locomotive
2—8 Ton Goodman Battery Locomotives
2—8 Ton General Electric Battery Locomotives
3—8 Ton Ironton Battery Locomotives
1—9 Ton Whitcomb Battery Locomotive
4—10 Ton Atlas Battery Locomotives
2—10 Ton Jeffrey Trolley Locomotives
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1—13 Ton Goodman Trolley Locomotive
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Tube Mills	5' x 22', 6' x 22', 6'-6" x 21', 7' x 18'

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Dorr Rake Classifier	4' x 20', 8' x 38', 12' x 31'
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1 Marcy "66", 200 HP, 440 volt
1 Eimco "66", 125 HP, 440 volt

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1 Dorr Duplex Rake 60" X 26'
1 Wemco Bowl 12', 48" X 31'

LABORATORY EQUIPMENT

1 Ro-Tap Sieve Shaker
1 DFC No. 2 Jaw Crusher
1 Braun UA Pulverizer
1 Braun UD Pulverizer

AIR TUGGERS

3 I.R. Model D6U
2 I.R. Model D6UL
1 G.D. Model HB
2 G.D. Model HK
4 Sullivan E-111
2 Sullivan F-113

AIR SLUSHERS

1 G.D. Model HEE
6 I.R. Model A4NNOJ
4 I.R. Model A5NNOH
1 I.R. Model HNN1J
1 I.R. Model HS
7 Sullivan S-211
1 Sullivan HDA-2

ELECTRIC SLUSHERS

1 I.R. Model 5 NNOH
1 Sullivan HDE-5

LOADERS

1 Eimco 12-B 18" or 20"
1 Joy HL-3 18"

LOCOMOTIVES

1 Mancha Little Trammer 18"-24"
2 Mancha Electric Mule 18"
2 Goodman Type 86 18"
2 Atlas Trammers 18"

CRUSHERS

1 Allis Chalmers 10" McCully
1 Allis Chalmers Gates No. 5
2 Wheeling 16" X 22" Jaw
1 Miners Foundry 9" X 14" Jaw
1 4' X 8' Symons Rod deck Screen

HOISTS, MINE SHAFT, 2 DRUM

1 Welman-Seaver-Morgan 500 HP
1 Nordberk 500 HP
1 Lingerwood 250 HP
1 Taylor 100 HP

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1— 9" x 36" Cedar-Rapids, Br. Brg.
1—10" x 16" Universal, Rlr. Brg.
1—9" x 19" Pioneer, Rlr. Brg.
1—10" x 20" Austin-Western, Rlr. Brg.
1—10" x 20" Good Roads, Rlr. Brg.
2—18" x 24" Universals, Rlr. Brg.

MISCELLANEOUS

1—5' x 6' Marcy Ball Mill
1—5' x 9' Kennedy Ball/Rod Mill
1—4-Cell (28"x28") D.E. Flot. Machine
1—No. 6 Wilfley Concentrating Table
1—20 HP Sullivan 3-Drum Slusher Hoist, 3/60/220/440.
1—30" Pacific Slushmaster Scraper

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8—5-ton C. S. Card Granby Type, 24" Gauge

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1—1500 CFM Worthington, 300 HP Syn. Motor
1—2000 CFM Worthington, 400 HP Syn. Motor
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2—HS15 Sullivan Diamond Drill complete
1—Longyear Model UG, Gas Driven

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1—375 HP Wellman-Seaver-Morgan Double Drum
1—150 HP Wellman-Seaver-Morgan double drum
1—700 HP Wellman-Seaver-Morgan Single Drum
1—300 HP Wellman-Seaver-Morgan Single Drum
1—150 HP Vulcan-Denver Single Drum
1—100 HP Couer d'Alene, Single Drum
3—75 HP Vulcan, Single Drum

HOISTS, TUGGERS & SLUSHERS

1—50 MNM4C Ingersoll-Rand, 3 drum, 440 V.
5—HNN1J Ingersoll-Rand, Slusher, air
4—A5NNOH Ingersoll-Rand, Slusher, air
1—HDE-2 Sullivan Slusher, 25 HP, 440 V.
1—J211 Sullivan Slusher, AT15, air motor
17—7½ HP Sullivan Slusher, 220/440 V.
1—A2F211 Joy Slusher, 15 HP 220/440 V.
27—15NN1G Ingersoll-Rand Slusher, 220/440 V.
1—HEE Gardner-Denver Slusher, air
3—E-113 Sullivan Tubinaire, air
1—D6UL Ingersoll-Rand Tugger, air
2—E-111 Joy Tugger, Air
1—EU Ingersoll-Rand Tugger

LOADERS

1—105 Eimco Crawler Loader, 1½ yd. bucket
7—GD9H Mucking Machines, 18" Ga.

LOCOMOTIVES

1—4 ton Mancha Battery, 24-42" Ga.
5—1½ ton Mancha "Little Trammer," 18-24" Ga. Charger-Battery
3—1½ ton Atlas "Type J" Battery, 18" Ga.
1—3 ton Jeffrey Battery, 18" Ga. complete
1—7 ton Plymouth Diesel, 18" Ga. Scrubber
1—7 ton Diesel Locomotive, 18" Ga.
6—4 ton Jeffrey Type Battery, 18" Ga.
1—1½ ton Baldwin Battery, 18" Ga.
1—1½ Ton Atlas Type J, Battery, 24" Ga.
4—Universal Tramaire, Air, 18-24" Ga.

CLASSIFIERS

1—45" x 17' Akins Spiral Simplex
1—48" x 17' Akins Spiral Simplex
4—78" x 36'6" Akins Spiral, Duplex
1—49" x 20'3" Wemco Spiral Simplex
1—36" x 19'3" Wemco Spiral Simplex
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1—5 x 6 Wemco Steel

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1—18" x 100' Hewitt Robins Belt, Steel structure, 2 HP

CRUSHERS

1—8 x 10 Denver, Jaw, R.B. New
1—10 x 21 Telsmith, Jaw, R.B.
2—36" x 48" Birdsboro Buchanan, 150 HP Motor
2—60" x 24" Traylor Crushing Rolls
1—15" x 24" Traylor Jaw, Blake type 50 HP
1—5½ Symons Cone
1—322 Type R, Allis-Chalmers Reduction
1—2' Symons Std. Cone, 30 HP Mtr.

FEEDERS, ORE

1—54" x 16' Stephens-Adamson Apron type
6—60" x 6'6" Apron Type, Manganese pans
1—42" x 96" Apron Type, 7½ HP Gearmotor
1—36" x 72" Jeffrey Grizzly, 440 V.
1—30" x 6' Travelling Apron Type feeder
2—24" x 8' Denver Adjustable Stroke
1—24" x 5' Denver Adjustable Stroke

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8—Clarkson Reagent Feeder, Model E

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2—6-cell #18 Denver Sub-A, 28" x 28"
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1—2-cell Size 36" Fagergren
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2—6 x 9 Allis-Chalmers Ball Mill
6—6 x 12 Allis-Chalmers Ball Mill
1—64½ Marcy Ball Mill, complete
1—6 x 4 Denver Ball Mill, complete
1—7 x 6 Allis-Chalmers Ball Mill
1—8 x 12 Marcy Rod Mill
4—5 x 14 Marcy Ball-Tube Mills

PUMPS, SAND

6—8" Wilfley Type C
16—4" Wemco Reconditioned
2—3" Wemco
2—2" Wemco, with motors
9—1¼" Wemco, with motors

SAMPLERS

3—Geary-Jennings Automatic

SCREENS

1—3 x 8 Allis-Chalmers Ripl'lo 2-deck
1—3 x 10 Overstrom, 3 deck
1—3 x 6 Symons Rod Deck
1—3' x 7' Link Belt, Single Deck

TABLES

2—13-S Wilfley Concentrating
106—Diester Concentrating

THICKENERS

1—13' x 7' Hardinge Lowhead, steel
2—20' x 8' Wemco, steel tanks

ASSAY EQUIPMENT

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1—4 x 6 Massco Jaw Crusher
1—5 x 6 Denver Jaw Crusher
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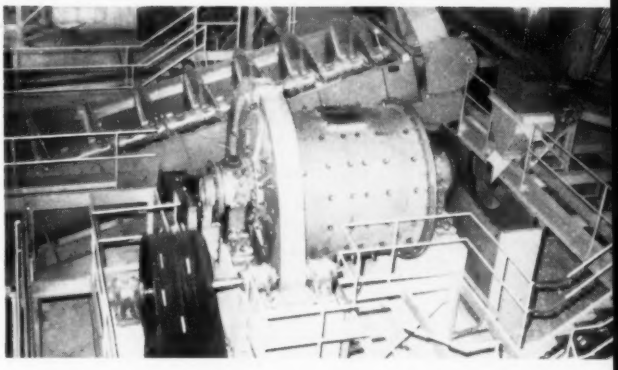

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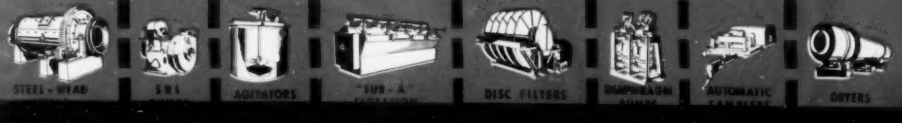

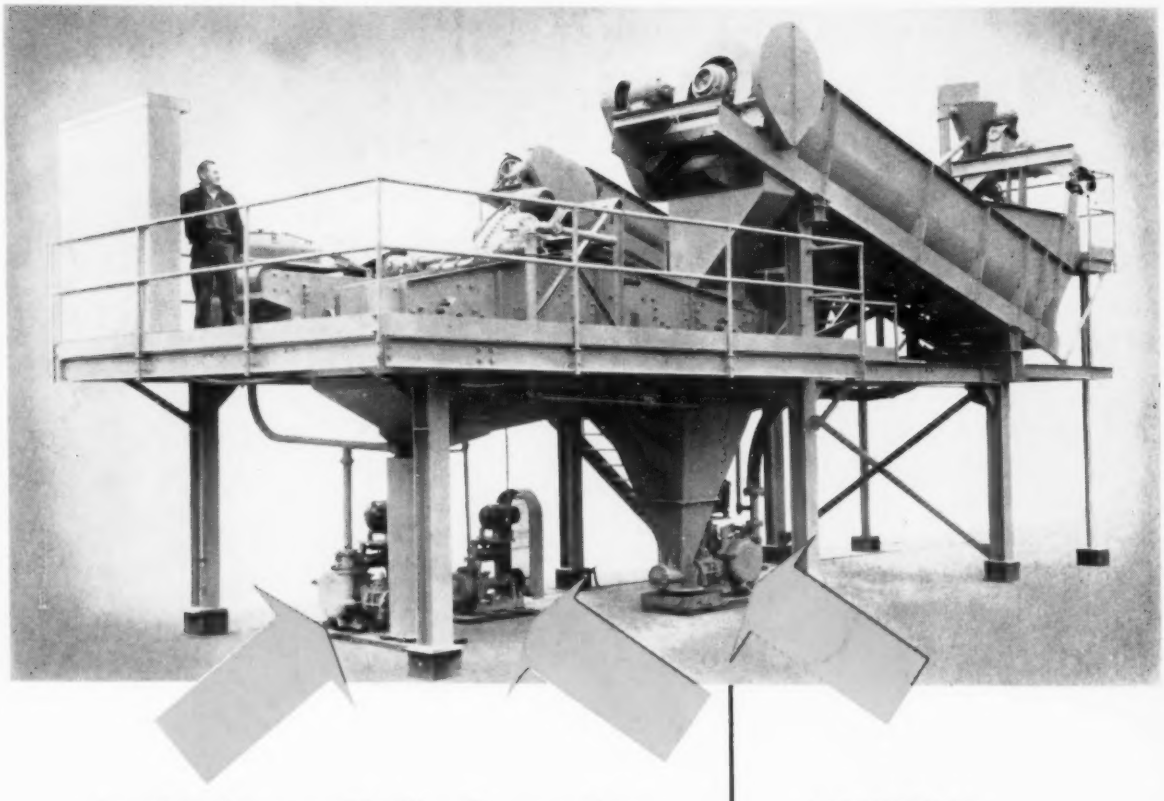

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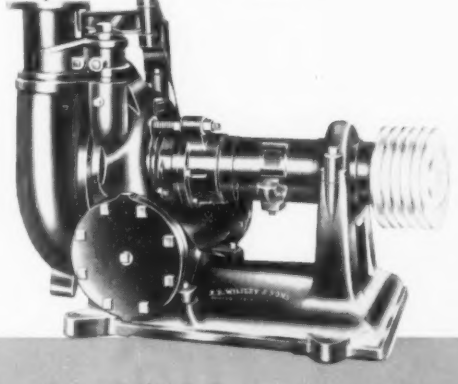

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